BULLETIN OF THE SCHOOL OF EDUCATION INDIANA UNIVERSITY

Vol. XXII July, 1946 No. 4

SCHOOL BUILDING PLANNING AND RELATED PROBLEMS

Proceedings

Division of Research and Field Services
School of Education
Indiana University, Bloomington, Indiana

WENDELL WILLIAM WRIGHT, Dean of the School of Education,
and Director of the Division of Research and Field Services

Price, 50 cents, postpaid
For sale by the Indiana University Bookstore,
Bloomington, Indiana

This bulletin is indexed by title in the following:
Bibliographic Index
The current literature section of the
Education Index

Entered as second-class mail matter September 30, 1924, at the post office at Bloomington, Indiana, under the Act of August 24, 1912. Published in January, March, May, July, September, and November of each year, from the University Office, Bloomington, Indiana.

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INDIANA UNIVERSITY

School Building Planning and Related Problems

Proceedings

Published by the
DIVISION OF RESEARCH AND FIELD SERVICES
Indiana University

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PROGRAM

School Building Planning and Related Problems

Tuesday, February 5, and Wednesday, February 6, 1946

Memorial Union Building **Indiana University**
Bloomington, Indiana

An Educational Conference for School Administrators, School Board Members, Architects, and Others Interested in the Construction, Maintenance, and Operation of School Buildings.

Harold E. Moore, Conference Chairman

Guest Speakers

Francis R. Scherer, Architect, Superintendent of School Buildings, Board of Education, Rochester, N.Y.

Don L. Essex, Director, Division of School Buildings, State Department of Education, Albany, N.Y.

INDIANA UNIVERSITY
School of Education
Bureau of Cooperative Research and Field Service

TUESDAY MORNING—FEBRUARY 5

9:30 A.M. Registration Lobby, Union Building

10:30 A.M. Alumni Hall Union Building

Presiding - - - - - - - - - - - - - - Charles Lutz
Superintendent of Schools, Gary

10:05 A.M.

Address of Welcome - - - Dean Wendell W. Wright
Indiana University

10:20 A.M.

Symposium on Audio-Visual Education Facilities

"Basic Criteria of an Audio-Visual Education Program" - - - - - - Lawrence C. Larson
Consultant, Bureau of Audio-Visual Aids, Indiana University

"Translation of the Criteria into Functional Housing" - - - - - - - - - Lowell Hopkins
Director, Audio-Visual Education, Evansville Public Schools

"Technical Considerations in Relation to Housing the Audio-Visual Program" - Karl R. Schwarz
Architect, South Bend

Discussion Leader - - - - - - - - - Otto Newman
Superintendent, St. Joseph County Schools, South Bend

11:40 A.M.

"Statement of Conference Objectives" - Harold E. Moore
Conference Chairman

TUESDAY AFTERNOON—FEBRUARY 5

1:30 P.M. Alumni Hall Union Building

Presiding - - - - - - - - - - - - - Harvey Poling
Director, Division of Elementary and High School Inspection, State Department of Public Instruction, Indianapolis

Address—"Community Planning for Schools" - - - - - - - - - - - - - - Francis R. Scherer

Discussion Leader - - - - - - - - Kenneth Schellie
Director, Indiana Economic Council, Indianapolis

2:30 P.M.

Address—"The Community School Plant" - Don L. Essex

Discussion Leader - - - - - - - Mrs. Joseph Walker
1st Vice-President, State P.T.A., Greenfield

3:30 P.M.

Conference Announcements and Adjournment

TUESDAY EVENING—FEBRUARY 5

7:30 P.M. Alumni Hall Union Building

Presiding - - - - - - - - - - - - - - David Wylie
Secretary, Board of School Trustees, Bloomington

Address—"Changing Trends in Education Significant to Problems of School Building Planning" - - - - - - - Dean Emeritus Henry Lester Smith
Indiana University

8:00 P.M. Panel Discussion

Topic: "Current Problems in School Building Construction"

Participants:

E. P. Bardwell, Chairman, Coordinator, Postwar Building Program, Indiana University
Wilbur Shook, Architect, Indianapolis
Luther Lockwood, Superintendent of Schools, Columbus
W. E. Mohler, Contractor, Indianapolis
Clarence T. Myers, Secretary-Treasurer, Policy Committee, Indiana Construction Industry, Indianapolis
John Fell, Secretary, Board of School Trustees, Kokomo
Cecil Grayson, Superintendent, Lake County Schools, Crown Point

WEDNESDAY MORNING—FEBRUARY 6

9:45 A.M. Alumni Hall Union Building

Presiding - - - - - - - - - - - - Orville Hooker
Superintendent of Schools, Marion

Address—"Estimating the School Population to Be Served" - - - - - - - Harold E. Moore
Indiana University

10:30 A.M.

Address—"Financing the School Building Program" - - - - - - - - - - - - - - - - Don L. Essex

11:15 A.M.

Discussion Leader - - - - - - - - John R. Emens
President, Ball State Teachers College, Muncie

11:45 A.M. Announcements and Adjournment

WEDNESDAY AFTERNOON—FEBRUARY 6

1:15 P.M. Alumni Hall Union Building

Presiding - - - - - - - - - - - - - Archie Chadd
Superintendent of Schools, Anderson

Address—"The Indiana School Building Code" - - - - - - - - - - - - - - - - Bert J. Westover
Director, Indiana Administrative Building Council, Indianapolis

2:00 P.M.

Address—"Planning Schools in View of Initial and Recurring Costs" - - - Francis R. Scherer

Discussion Leader - - - - - - - - Olis G. Jamison
Chairman, Department of Education, Indiana State Teachers College, Terre Haute

3:00 P.M. Adjournment

Basic Criteria of an Audio-Visual Education Program

by

LAWRENCE C. LARSON

As the initial speaker on this symposium on audio-visual education facilities, I have the subject "Basic Criteria of an Audio-Visual Education Program." It is my responsibility to suggest some general policies embodying both philosophy and practice which may be used as a guide in outlining specifications for the school plant and facilities that will permit the optimum use of audio-visual instructional materials. Since the time is limited, I am going to present for your consideration four general statements which will serve as a basis for our discussion during the forum period:

1. *Audio-visual materials should be used in the school under conditions that are conducive to optimum learning experiences for pupils.* Both prewar studies and experiences of the military services in the area of audio-visual education indicate that these materials make their greatest contribution in the improvement of instruction in the classroom. It is only as materials selected to bring to pupils fundamental subject-matter experiences are used in the classroom that their optimum educational values can be obtained. This position is emphasized by Francis W. Noel, Chief of the Division of Audio-Visual Education in the California State Department of Education. In a recent communication to California school administrators, he states: "The use by small groups, in the regular classroom environment, of materials chosen in terms of curriculum needs and utilized in the light of good instructional practices is the fundamental justification for audio-visual materials in the school." Used in the classroom, motion pictures, slides, radio transcriptions, models, and other materials are integrated with the textbook and with other activities planned as a part of the instructional unit. Each is used during the class period under the guidance of the teacher at the particular time when it will make the greatest contribution to an understanding of the unit of work under consideration. Because of the educational effectiveness of the classroom use of audio-visual materials, it seems likely that in the near future teachers in a number of schools will use, on the average, one film in a course each week and will, on a somewhat comparable rate, use other types of audio-visual materials.

On the basis of my analysis, the special audio-visual classroom to which teachers would bring classes for the showing of films cannot be recommended. As teachers increase their use of audio-visual materials, a ratio of one special audio-visual classroom to five classrooms would be required. The cost of original construction of such rooms and maintenance would greatly exceed the cost of providing for the control of sound, light, and ventilation, and for demonstration, display, and exhibition facilities in the construction of all classrooms in new buildings.

From the viewpoint of educational effectiveness and financial economy, all classrooms should be so designed and planned that teachers will be able to use effectively all types of teaching materials.

So far in my discussion I have emphasized the use of materials in the classroom. It is expected, however, that audio-visual materials will play an important role in all activities carried on under the auspices of the school. Therefore, consideration should be given to the control of sound, light, and ventilation in special rooms for music, industrial arts, and home economics, and in the gymnasiums and auditoriums.

2. *Teachers should be provided with assistance needed in the selection, planning, scheduling, circulation, and utilization of materials and equipment.* The problem of providing assistance to teachers and pupils in the utilization of audio-visual materials has been handled most successfully in those school systems where the superintendent has organized an audio-visual center with an experienced and trained director and the necessary clerical and technical assistants. In the case of smaller schools or individual schools within a large school system, the director of audio-visual materials should be able to coordinate the program on a part-time basis. Larger schools need a full-time director who has had three to five years of successful teaching experience, followed by training in the field of audio-visual materials. He should be familiar with the content of the more widely used films, radio transcription, film strips, and other materials, and should possess organizational and administrative ability.

A qualified director will devote most of his time to working with teachers in the selection of, planning for, and utilization of materials. Teachers particularly need help in selection. For example, a fifth grade teacher in planning a unit on soil resources may find described in various film catalogs 20 to 25 different films dealing with soil conservation. The director who is familiar with materials will be able, following a conference with the teacher on the content of the unit and the teacher's purposes, to suggest one or two films for the particular teaching situation.

Following the selection of the film, there is the problem of scheduling both the film and equipment for the day the film is to be used in the classroom. The transportation of film and equipment to the classroom and the providing of an operator are elementary administrative problems which are easily handled within a planned program. Scheduling, circulation of equipment and materials, operation of equipment, and maintenance and repair of materials and equipment can be handled by persons with clerical and mechanical abilities and by pupils under the supervision of the director.

In order to carry on activities which I have described in a sketchy fashion, the audio-visual materials center should include a director's office and conference room, a general office and catalog and reference library room, an audio-visual demonstration and exhibit room, a repair and work room, and a room for the storage of equipment and materials.

Finally, I want to point out that in some schools teachers are making reference assignments to films and recordings. Pupils during study

periods check out films, recordings, and slides as they would reference books and take them to a reference room with tables equipped with projection and phonograph equipment and headphones. In the case of reading rooms equipped with such tables, pupils not only read books and magazines but also listen to recordings and view motion pictures and slides.

This development suggests that the audio-visual materials center should be adjacent to the school library in order to permit a cooperative use of some rooms. Moreover, it may be desirable in some schools for the school librarian to supervise the clerical and mechanical staff members responsible for scheduling and distribution and the repair and maintenance of materials and equipment. This division of responsibility will permit the director of audio-visual materials to devote most of his time to working with the teachers in the selection, planning, and utilization of materials.

3. *Each school system should have facilities, equipment, and technical staff required for the production of audio-visual materials by teachers to meet local needs.* Even though excellent audio-visual materials are being produced in increasing quantities in the more important subject-matter areas, all schools should plan to produce the more important types of materials to meet local needs—this activity should be carried on in the AVM center under the leadership of the director of audio-visual materials. Teachers with an aptitude for or interest in preparation of materials will be able to produce slides, film strips, motion pictures, recordings, and other materials with the assistance of photographic and sound technicians.

To provide for the production of materials, facilities of the AVM center should include a work room for the preparation of posters, charts, maps, models, and specimen and object materials; a studio and copy, printing, and developing room for still and motion picture photography; and audio studios which may be wired to auditoriums, music rooms, and selected classrooms.

In the case of larger school systems, provisions should be made for the installation at a later time of an FM broadcasting station to serve school and community.

4. *Arrangements should be made for the use, by community groups, of audio-visual materials owned by the school as well as of equipment, production facilities, and professional and technical staffs.* During World War II, a number of governmental agencies turned to the production and distribution of 16mm films as a means of providing farm, labor, and civic groups with information about the progress of the war. These agencies quickly discovered that adult audiences could best be reached by working through the schools. The local school director of audio-visual materials had served as a consultant to leaders of community groups in the selection, ordering, and showing of films, and was willing to continue to perform the same functions in the school and community to bring about the widest possible use of government films. The schools usually owned the available equipment, and most school officials made the equipment available for use by community groups during noon

hours and after school in the evenings and on week ends. Members of the student operators' club or faculty members operated the equipment on a voluntary basis. Thus the school became the center for carrying on film projects for community groups and organizations.

It is reasonable to assume that in many communities the resources of the schools' AVM centers will continue to be made available to community groups. Motion pictures, film strips, slides, and other materials in the library, and projection and phonograph equipment would be available during the evening and during the summer. The photoplay societies, photographic clubs, community radio workshops, and other similar organizations would hold their meetings in the schools' AVM centers in order to take advantage of photographic and audio facilities and equipment and of the assistance of the director and technicians. Leaders of adult groups would rely on the director of audio-visual materials and his staff for direction and guidance in the planning of programs using audio-visual materials and, where necessary, in the production of films, slides, recordings, and other materials to meet local and community needs.

With the AVM center serving as a center for both the school and the community, particular attention should be given to its location in the school building. Facilities must be easily accessible to both teachers and pupils. On the other hand, since the center will be used evenings, week ends, and during the summer by community groups, consideration should be given to making the center a self-contained unit that can be closed off from the rest of the building and heated satisfactorily during the evenings and on week ends.

In conclusion, I want to point out that the foregoing statements represent my own opinion on the possible role of audio-visual materials in the elementary, secondary, and adult programs of education. It must be emphasized that the value obtained from the program of audio-visual education depends on the extent to which these materials become an integral part of the school's program and of the social and cultural life of the community. By including in plans for new buildings the necessary adaptations and facilities to permit a satisfactory use of all types of instructional materials, the cost of carrying on an excellent program of audio-visual materials can be kept at a minimum.

Translating of the Criteria into Functional Housing

by

LOWELL HOPKINS

THE creation in one's own imagination of certain plans, possibilities, or future hopes is sometimes thought of as an easy thing, yet this is the first step that must be taken if definite progress is to be made beyond the present realities. This does not mean that we have only ideas upon which to base our plans for functional housing of audio-visual aids, because there are many cities, states, and other organizations which are housing audio-visual aids in one manner or another. But I doubt if there is any place which has a type of housing that even an easily satisfied individual would say is entirely satisfactory.

Most of the space given to the housing of audio-visual aids is more or less of a makeshift, a renovation of older buildings and rooms to meet temporary needs rather than permanent needs.

We quite often speak of a department of music, of art, of history, and of audio-visual aids. This may be satisfactory usage if we are aware of some of the characteristics of such a department. One characteristic is that it cuts across all other departments so that it cannot be separate and apart from any of them. A functioning program of audio-visual aids will facilitate instruction in all phases of an educational program.

Another statement or assumption that should be made here is that many school corporations, both large and small, will be establishing divisions of teaching material aids. The size of the school system will determine, to a large extent, the facilities necessary. The smaller school corporation will establish film libraries, for example, which contain a few of the most frequently used films, supplemented with rented films from larger lending or rental libraries. The larger schools will establish larger libraries, either by the outright purchase of films or by school produced films, and supplemented by the rental of seldom used films from still larger commercial companies, state universities, and state departments, and of films sponsored by the various federal government agencies, or perhaps from industrially sponsored films.

Perhaps the best way to see or to present the needs of functional housing is to consider some of the basic criteria as presented at this time, and then to translate these needs into a working arrangement. Let us start with a common and well-known aid, such as the motion picture film.

Before we can acquire the film, correspondence with one or more companies is required. This implies that an office is necessary. Since this need not be different from any other office in which we have a place to work, with desks, typewriters, and filing cabinets, we can pass over this at present.

Let us follow the film on its journey and note some of the attendant housing problems. If the film is purchased, one of the first problems that will present itself is that of storage. The storage should be in a place that can be reasonably well protected from an undue amount of dust and dirt, and from extreme ranges in temperature. This does not mean that a vault is necessary, but neither does it mean that any old basement room or other unused space is satisfactory.

Another problem which we might consider is that of the preview of the film. If the film is to be used as an aid in facilitating instruction, someone must preview it and determine where and when it can best be used. This requires that a room with projection facilities be available. Briefly stated, these requirements are that the room can be darkened and that an electrical outlet for connecting the motion picture projector must be accessible. However, a much more desirable arrangement is to have a room that is properly ventilated, with acoustical treatment and a separate compartment or booth for the projector. If one is to evaluate motion picture films critically, the projected picture should be comparatively large, and the entire accompanying sound should be audible. Very often it is desirable to have small groups of teachers or committees preview a film, and this presents the problem of providing a room with a more or less limited seating capacity.

After the decision of where and when the film can best be used, it is necessary to deliver it to the teacher or other person who is to use it either at the request of the teacher or at the suggestion of someone else. If truck or delivery service is available, the problem may be rather simple, while mailing or other special arrangements may become more complicated. In any case, provision must be made for a place or origin of some type of delivery service.

Classroom projection.—The place where the final and most rigid test of value of any visual aid is made is in the individual classroom. The classroom should have the same facilities available as were previously mentioned in connection with a preview room. The most common difficulties presented here are the problem of darkening the room, the problem of acoustics, and projection problems. Once these problems are met and solved, the use of visual aids becomes a forceful and valuable servant of the teacher. While it might appear that a program in a school city having a good place for the storage of films, preview rooms, and many of the other things which will be mentioned later was very satisfactory, yet from the practical point of view of the classroom teacher the program might be a failure because it breaks down at the very place where it should be most usable.

In other words, the teacher should have a room in which audio-visual aids can be used without going to so much trouble that she feels it is a major undertaking actually to use these aids. If it is made easy to secure the films and the projection equipment, these aids will be used. Otherwise, the teacher will revert to the easier and more formal method of using the textbook or other methods and means which require less effort. This in no way condemns the teacher; rather, it shows good judgment on her part. No one should be criticized for recognizing that a plan is

not workable. But when one sees how vital, how intensely interesting, a subject can become by taking advantage of a few good visual aids, it becomes a challenging problem to any future educational planning.

Inspection and repair of aids and equipment.—We have now followed the film to the classroom where it is to be used. If the facilities are available, the teacher will use it, but even if it is used under ideal conditions, occasionally it will be damaged. Generally speaking, this damage will be of a very minor nature—perhaps a torn sprocket or a broken film. The film then should go back to its point of origin, the distribution center, and there it should be inspected and, if necessary, repaired.

It should not be necessary for the classroom teacher to become unduly alarmed about breaking or even burning a spot on a film. In the inspection and repair room the repairing of the damage is usually quite simple. The point is, however, that some place must be available for this type of work.

Now in following the film on this short imaginary trip, we have implied that certain housing functions are necessary. This very simple illustration of the use of one film makes less obvious some of these necessary housing functions. But to show that the problems are real, we might use an illustration from our own system. In the school year of 1941-42 we circulated 3,307 films. Most of these films came from our own library, but some were rented, borrowed, furnished free, or available with the payment of transportation charges.

We might further analyze the utilization of these 3,307 films in order to give a little better idea of what the problem is. Since we have approximately 500 classroom teachers, this would be an average use of about 6½ films per teacher during the year. Practically all of the films in our own library are single reels, and most of them are sound films. Since the running time of a one-reel sound film is between 10 and 11 minutes, and that of a silent film is about 14 or 15 minutes, a good estimate would be that the average time per teacher use of films would be near 75 or 80 minutes a year, or from an hour to an hour and a half. Any one who is aware of the many good education films available would certainly say that this is very low in desirable film utilization. What actually happens, of course, is that many teachers use no films at all, and many use 15 or 20 each semester.

In the example of the film, there are a few housing functions which have been pointed out and a few implied. Let us enumerate these and point out some necessities in translating the basic criteria of an audio-visual education program into an arrangement which we can call "functional housing."

The housing of a program will need to consider the following needs or functions:

1. Administration
2. Library of materials
3. Receiving, shipping, and circulation
4. Classroom facilities
5. Maintenance and repair

6. Production
7. Demonstration

Let us consider each of these points briefly.

1. Administration. In order for the program to be initiated or, if a program has already been established, to be directed, there must be administrative responsibility. The administrative office or offices will vary in size with the needs of the school system, but some place must be made available for receiving and checking requisitions, keeping records, ordering films, providing catalogs, etc.

2. Library of materials. A comparatively small space will be needed for such items as slides, records, still strips, and films, while more space will be needed for objects, models, and specimens. Particularly if one is going to provide a place for exhibits of charts, objects, and museum materials, and for the storage of these things, a large amount of space is needed.

3. Receiving, shipping, and circulation. The receiving and shipping of audio-visual aids can be done in any ordinary room which should be located near the place where delivery service is available. If truck delivery service is available, the problem of circulation is quite simple. If this service is not available, more space would be necessary for wrapping, mailing, etc.

4. Classroom facilities. As has been previously stated, but worth repeating, the test which will determine the real value and worth of audio-visual aids will be made in the classroom. If everything that is desired is available except a classroom which has adequate projection facilities, the program will be a failure. The difficulties which present the greatest problems are those of darkening the room, ventilating, providing good acoustics, and providing electrical outlets. Dark shades or dark curtains are needed for the use of opaque projectors and are very desirable for lantern-slide and motion pictures. If the room is ventilated by the open window method, the use of shades and curtains may present a difficult problem of ventilation. Acoustical treatment of the room is very desirable, not only for the use of audio-visual aids but for any ordinary classroom use as well.

New as well as old classrooms should be provided with sufficient and properly-spaced electrical outlets for motion picture projectors, opaque projectors, lantern slides, still strip projectors, and record and transcription equipment.

5. Maintenance and repair. A maintenance and repair shop, where a few necessary tools and supplies, such as photoelectric lamps, exciter lamps, radio tubes, and other items which are needed frequently, is very necessary. Some person has to be delegated to take care of certain minor repairs which must be made from time to time. A small repair shop where this work can be done will soon pay for itself.

6. Production. It is difficult to say what will be needed in the way of housing for school production. School-made movies, slides, objects, models, still pictures, and other aids are being produced in in-

creasing quantities. This was true especially just before the war. Many schools will be enlarging their programs in the near future, so that dark rooms and facilities for the production of radio programs will be needed more frequently. With the further development of wire recorders, it will become increasingly simple to make and produce short radio programs.

7. Demonstration. Space for demonstration may be found in buildings which are already available, but in closing I would like to point out the necessity for such demonstration. It is very likely that we shall see many audio-visual aids used improperly. This is nearly always the case with the advent of some new development. It will be necessary to do a great deal of in-service training with many of these teachers who are now in service and a few good demonstrations will be a big help in securing the proper use of these aids.

In conclusion, the functional housing will have to consider the implications of the several points mentioned; namely, (1) administration; (2) library of materials; (3) receiving, shipping, and circulation; (4) classroom facilities; (5) maintenance and repair; (6) production; and (7) demonstration.

While there are many other needs that could be mentioned if a functional housing program considers all of these points, the children in school will have an opportunity to enjoy and profit from an enriched curriculum.

Technical Considerations in Relation to Housing the Audio-Visual Program

by

KARL R. SCHWARZ

WE just have heard two splendid discussions of the potentials of audio-visual educational aids. Our problem now is the translation of these criteria into the actual physical school plant.

The problem subdivides itself into three main considerations:

1. The design of the space volume itself
2. The construction of the enclosing surfaces of our space volume
3. The installation of facilities within the surfaces

The first consideration affects, primarily, new construction—the latter two, both new and old structures.

Inasmuch as this discussion concerns the use of audio-visual materials, our thinking must be predicated on the effect of our main considerations on:

1. Hearing or sound
2. Seeing, which is light

In considering the space volume, we must provide for:

1. Adequate space for present requirements
2. Flexible space to allow for future changes in teaching methods

To this end, the whole structure should be designed in the same manner as most industrial and office structures: A beam and column system with relatively few structural or bearing partitions. In like manner, exterior surfacing and windows are designed so as to be in a regular or modular progression, and, if the mechanical lines be run on a modular basis, the whole space could be subdivided into the various sized and shaped rooms the teaching requirements demand at any time during the life of the structure.

This repetition of the basic unit has been followed in the design of structures and therefore would be almost as adaptable as new structures, perhaps losing complete flexibility only with regard to the mechanical lines.

It must be borne in mind that certain shapes of rooms, primarily those having circular segments for walls or ceilings, are very difficult to treat from the standpoint of acoustics or sound and must be carefully studied to preclude a situation for which there is no solution. Other than this, the design of the space volume should be wholly predicated on the teaching requirements.

Our second main consideration, that of the enclosing surfaces of our space, develops several requirements:

1. Economy as to first cost
2. Ease of change
3. Economy of maintenance
4. Desirable sound and light reflective qualities

In new structures, because labor now is the large item in construction, it is possible to spend money on materials if savings in labor can be made thereby. For this reason, movable partitions are relatively flexible partitions can be economical as far as first cost is concerned, providing for future change, just as in office structures. For this purpose there are many materials on the market which are economical as to first cost, relatively simple to maintain, and proved by years of service—from patent sectional partition units, through various solid sheet units, to gyp block and tile ready for facing. Too, our cabinets can be made to become partitions.

For floors and ceilings, steel, concrete, and wood are all available, serviceable, and adaptable to any scheme and any cover. For exterior walls, concrete, masonry, or some of the new sheet materials may be used for the solid portions, with various combinations of glass used for the introduction of natural light. As demonstration, and the greater use of models and display material gain credence as teaching aids, so also does the need for better distribution of more light become apparent. Intensity at the window must be reduced, but the general level of illumination must be increased to a minimum of at least 30 foot candles. This may be accomplished naturally, primarily by proper ceiling design, proper selection of color for reflectivity, and bilateral windows. Artificially, this can be produced by a thorough study of the room lighting. However, during certain demonstrations and projection of pictures, outside light is undesirable and the windows must be blacked out. For this reason, fenestration should be as simple and as continuous as possible to effect an easy economical covering. This latter consideration, however, sets up another problem—that of obtaining proper ventilation in the room when the fenestration is covered, if there is dependence on the windows for the introduction of fresh air. A solution to this problem is suggested through the use of fixed glass, with outside air being introduced through separate ventilating openings, using louvres for exterior protection and removable or hinged insulated panels for interior protection.

As we have considered the enclosing of the room from the theoretical standpoint and have considered its lighting, now let us examine its acoustical characteristics. The room surfaces all have a certain degree of hardness, therefore a certain degree of sound reflectivity, the aggregate of which will determine the quality of sound within the room. This reflectivity may cause a sound to be distinctly repeated, the common echo; or it may cause the prolongation of the sound in indistinct or jumbled form, called reverberation. Echo is objectionable always; but, while some reverberation is desirable and necessary inasmuch as complete absorption will produce a dead, dull effect, control is also needed lest reverberation be so great as to produce a fatiguing effect on the listener.

The reverberation time of a room may be computed by the formula suggested by Dr. Sabine, in which $T_o = .05\frac{V \text{ (volume of room)}}{a \text{ (total of absorption of room)}}$ where T_o = time in seconds in which reverberant sound sinks to one-millionth of its initial intensity, or from 60 decibels to 0 decibels. As the absorptive coefficient of most materials is known and their area in the room computed, as can be the volume, the reverberation time may be compared with the optimum reverberation period. The optimum reverberation period, which is dependent on its volume and its intended use (speech, music, or both), varies on a logarithmic curve, and may be found in tables and charts by Sabine, Watson, Knudsen, and other experts in the field.

The optimum time of reverberation for an ordinary classroom is from .75 seconds to 1 second, according to Watson and Knudsen. The reverberation time of the usual classroom is 4 to 5 seconds, which indicates the reason for the poor quality of sound as developed in the projection of sound films in most classrooms.

In new structures the surfaces may be so designed as to produce optimum values for reverberation. In existing structures the same variety of materials is at hand, but they must be put on over existing surfaces which, while reasonably expensive, will return large dividends in teaching facility. There are the plain fibre boards and tiles, relatively soft, which can be nailed or glued to a prepared surface at from 10c to 20c per square foot. These cheapest units also do the least correcting. Next come the perforated fibre tiles, acoustical plaster and plaster-like tiles, the stone-like tiles, and cork boards, all with voids for sound absorption, ranging in price from 30c to 60c per square foot applied. These, while more expensive, perform more work, and usually are easier to maintain and can also be repainted with little effect on their sound absorption qualities. There are other materials, such as metal and hard boards, perforated with many holes, using a woolly material as backing, all of which have their place for specific uses. In the use of these corrective materials in any room, two basic requirements must be understood:

1. The absorbent material should be applied to the surfaces surrounding the listener.
2. The correction should be applied to several surfaces—not exclusively ceiling, side walls, or rear wall.

For proper listening inside a room, another form of sound must be eliminated—that from the outside, or noise. Noise can be borne through walls by vibration or by direct flow through cracks. Likewise, sound may be carried to rooms by the ventilating ducts, either by direct flow or by vibration. Ducts offer a further offense in that fan noises and air whistle may also be transmitted. All these extraneous noises may be dampened at their source by use of extremely absorbent materials in the corridors and by use of absorbent liners in existing metal ducts and use of constant speed (fans and redesign of grille) faces. In new structures, nonmetallic duct and lower speed fans, coupled with larger duct sizes, will curb duct interference.

Now, when we consider the installation of facilities within the volume, we come to even more complex problems. We have said that the space must be flexible, but we yet must provide all the necessary mechanical aids to use efficiently these visual and audio aids.

All rooms require a certain amount of storage space now and will require more as time progresses. If certain of our walls could be of standard sized frames with various storage units designed to be placed therein, we would have our flexibility and provide the storage area, too. These cabinets could form the corridor wall or the partition between rooms, or could be placed under the windows. There is no reason why this cannot be at once economical and yet efficient. The tile, brick, and marble or glass wainscoting found in most school corridors is not cheap, nor is a solid wall of no cost.

To most areas it will be necessary to run additional water and waste lines for project centers, and to increase electrical facilities to provide both convenient outlets and increased power for the new equipment and lighting.

To provide proper ventilation to the rooms, a problem increased by the changing aspects of the use of the volume, we must restudy our mechanical systems. Most ventilating systems provide air noise because of too great velocity—a noise most distracting to proper recitation or study. With use of sound film, recordings, and the like, this problem is magnified. For a flexible use of space, the ducts must be so run and fitted that volume flexibility is not destroyed, yet they must provide ample low velocity fresh air.

All of these mechanical lines should be installed on the same modular basis as the rest of the structure: a water connection every so many feet, electrical outlets at regular intervals with branches at regular panel points, ventilating openings at regular intervals. Specifically, the classrooms should contain the following:

1. Sufficient cabinet area for the efficient storage, display, and use of the various visual aids—variable according to the subject at hand, but all providing for the setup of projectors.

2. An adaptable surface for a projection screen, located for the greatest visibility, the inside front corner of the rooms probably being the best location, with fold-away surfaces painted black on inner surface to form a shade pocket for the screen.

3. A window darkening device, be it a shade shutter, venetian blind or, preferably, curtains of denim or synthetic material drawn on transverse rods.

4. Two convenient outlets at the front, two at the rear, and outlets along the side wall probably 15′ on centers, as well as plug in strip at work centers.

5. A good 8″ or 10″ speaker of dynamic type with baffles, mounted high at the front of room, wired to room outlets at front, rear, and side as well as to the whole school system. This speaker must be integrated with the projectors, record players, radios, and other audio equipment.

6. A radio aerial plug.

Extra facilities, as well, should include:

1. A power outlet at regular intervals of up to 10 H.P. capacity, for use of special heavy duty equipment
2. Special areas in each departmental volume which can be flexibly used for radio control rooms, projection, or television control, or for many special uses the development of which is foreseen
3. Areas which may serve to link two or more rooms into one large area. Certain of these areas may be designated for community use and should provide for all the possible activities conceivable. These community facilities should be so arranged that they can be closed off from the remainder of the structure and be independently heated and lighted.

The various special areas, such as gymnasium and auditorium, should follow the same general considerations as the other volumes. In this connection, may we ask some pertinent questions:

1. Why have windows in either room when both light and ventilation must be supplied artificially anyhow?
2. Why not, even in small schools, set up an area as a good auditorium or little theater with a good working stage and simple overhead spots, for full community use?
3. Why not make the gymnasium a good one, unencumbered with stage and other auditorium trappings?
4. Why not use the grounds of our schools as further classrooms and demonstration areas?
5. And above all why not scale schools to children, remembering that they are places for learning and that they are primarily for the use of children?

Community Planning for Schools

by

FRANCIS R. SCHERER

TODAY many areas are preparing to increase school plant facilities by way of new buildings, additions, or remodeling. Many of these projects will become objects of much greater community concern than has heretofore been shown. This interest can and should be encouraged, for not only will it result in a broader and more beneficial use of the school plant but in many cases it will be the factor making possible the project itself.

I first bumped into this matter of community interest when, upon taking graduate work in Municipal Administration at Ann Arbor, I found in one of the assigned texts in political science the story of the pioneer work of Edward Joshua Ward. In about 1912 Ward aroused sufficient public interest in Rochester to have the school board incorporate, in its new elementary schools, features which would permit them to be neighborhood centers—making schools for the use of all members of the family for educational and recreational purposes. In those days special facilities in the Rochester schools placed the emphasis on cooking, sewing, and manual training. Use was made of the school auditorium and gymnasium and, noteworthy, each of these schools was equipped with a swimming pool.

Throughout the country today, many school curriculums include regular day classes for prekindergarten children and for groups beyond the senior year of high school. Also, some have regular day classes for adults. There has been a definite upswing in the requests made upon school authorities by communities for facilities, frequently including teaching or guidance personnel, for use outside of regular school hours and, occasionally, for use during school hours. These activities generally involve cultural, educational, recreational, or civic affairs. Surely a closer relationship exists today between the community and the school than existed even a decade ago. One senses the effort on the part of school administrators and of community leaders for better understanding of one another's problems.

This increased participation in affairs concerning the school plant by an increasing number of adults is making for a more intense interest in things that affect the school, for an active patron displays a bit of that same pride in "his school" that the average home-owner takes in his home. Things that are going to happen to "his school" are closer to him than heretofore, and he is not so willing to leave the matter entirely for some one else to settle. When an improvement, or an addition, or a new building is up for consideration, he undoubtedly will be found behind the movement that conceives the project. His will be a sustained interest, because now he and his family are more fully identified with the project,

it is going to be their building, he is one of the fellows who is going to pay the bill, and he well might do that paying with fewer gripes.

This does not mean that all of these patrons can be crowded into the board room, or the administrator's office, or the architect's drafting room to act in a consultant capacity for the preliminary planning, but there is a time during the formative period and development where his opinions can be voiced and reviewed. Getting his opinion across is not too difficult for the moderately agressive or vocal constituent. As a rule, these do not constitute the majority, although they might well influence majority opinion. School trustees and administrators should furnish the leadership so that all of the citizenry are adequately informed as to the general scope of the project and the reasons for it. Opportunities might be given to these people to attend one or more meetings at which the proposed project can be explained and their questions answered. The local press can do much to carry the message into the homes.

A project is off to a bad start when those closely connected with it are not in agreement among themselves as to its scope. The school administrator's first problem, then, becomes that of selling his ideas to his own school trustees, a job which is not always easy or successful.

This audience does not have to be reminded that no school building project should be undertaken without an adequate survey of the community to be served. In addition to ascertaining the immediate needs and the long-range demand to be made upon the plant, there should be definite civic planning, so that the school project will properly fit into the over-all picture of planning and zoning for the region larger than the community, as well as for its relationship with other projects within the community itself. This is for the purpose of avoiding duplication of facilities and unwise location with respect to an orderly development of the community in terms of a long-range plan. The blight occurring in many of our cities today must stand as a warning to the newer communities, some of which in the years ahead are destined to become the cities of tomorrow. Only as that growth is scientifically directed will the taxpayer's investment in his home and in his public institutions be adequately protected.

We have heard the merits of P.W.A. school projects debated, but nowhere in the arguments on either side have I found a single attack upon its very definite requirement that the contemplated project must include the approval of the state planning agency. I daresay that many school districts today have the power to determine by and for themselves just what to build and where to build without the obligation to fit the project into a larger pattern.

When the proposed school is in the "talking" stage, with only line sketches made preparatory to agreement upon a preliminary plan, interested representative groups and individuals in the community might well be consulted as to their views, especially their views concerning the facilities to be offered over and above those basically required for the educational program. Groups such as the Parent-Teachers Association, various civic clubs like Rotary, Kiwanis, and Lions, war veterans' organizations, Chamber of Commerce, Council of Social Agencies, Council on Postwar Problems, Advisory Board for Vocational and Extension Edu-

cation, League of Women Voters, musical and literary groups, the Grange, and others will take a general interest in the project, and might be expected to take a particular interest in the planning of facilities closely linked with that particular community betterment for which they act as sponsor.

I have just made a review of the various interests involved in the use of our public school plant during recent years. It was a revelation how these have become almost legion within late years. They include adult education classes (minimum age 16) in shop, homemaking, and health education. There are English classes for the foreign-born, and classes for persons in industry where related work is given. In all of these, state financial aid is received, but only in the case of the technical and industrial work supplemental to daily employment is any federal aid received. The Y.M.C.A. and Y.W.C.A. have sponsored clubs. There are the Boy and Girl Scouts and the Cub Packs, and P.T.A. meetings. The American Red Cross, the Home Bureau, and draft boards consistently use the facilities. Groups within some of the industries form clubs which meet regularly for discussion and for health education. The Youth Commission and Social Agencies sponsor regular evening programs as part of their effort to reduce juvenile delinquency. The sponsoring groups usually pay for the custodial service required for evening operation of the buildings, the Board of Education making no charge for the fuel, light, or cleaning. Activities sponsored by the Youth Commission and Social Agencies pay for the director and his assistants and custodial personnel, while the school board furnishes the balance.

Adult classes meeting in the afternoon or evening can represent a substantial part of the school load. In one recent year the adult registrants in the schools in my city have numbered about 60 per cent of the regular day school registrants.

About one half of American youth in the age brackets 12 to 19 live in urban communities. The other half are rural and divide into farm and non-farm groups. Location, however, should alter the general problem of community use and interest only in the matter of facilities provided. For example, schools in farm regions might include such facilities as agricultural laboratories, shops for agricultural machinery, and shops for some work in the building trades. In general, school officials strive to provide as good educational services as the community can afford. Such services are being broadened so as to include those for cultural, recreational, scientific, and shop facilities for adults and young people, open to them both daytime and evening.

If school buildings are to serve community requirements best, something is to be gained by knowing those requirements before we plan and build. The school board should frankly discuss with community groups the costs involved, whether the plan is worth the cost in terms of the use that will be made, and whether the additional cost involved can be financed. When agreement is reached, much additional support for the project will be at hand.

With the use requirements before it, the building planners will exercise their good judgment in locating the facilities for extracurricular

use so that they will be accessible and will provide proper integration into the regular program. Heating controls, toilet provisions, and availability of exits are but some of the details to receive special consideration. Many an otherwise feasible evening program has been defeated on the basis of per diem cost simply because the heating or exit arrangements were so poorly planned that all or a large part of the plant had to be heated or kept open. But most of the kicks seem to center around the inadequacy of eating facilities provided for these outside groups. Man being what he is, this item should receive serious attention.

School administrators embarking on their first building project would be wise to seek assistance and guidance from those with broader experience. Some of the professions, in the interest of the public welfare, limit their practitioners until a required apprenticeship has been served in professional status. This is for the protection of life, but in principle it could well be borrowed for schoolhouse planning in the interest of safeguarding public funds. Not every school administrator or architect has had broad experience in school house planning to draw upon in guiding the community or in carrying through the planning phase of the project. Sense of duty and obligation impel them to do the best job they can, and they will work untiringly to achieve something of which the community can be justly proud. A majority of them welcome advice and guidance. From my many contacts with both groups I know that the weakness in the setup has been the failure to make information in the school plant field readily available. Much has been done in late years to better this condition. Assistance can usually be obtained from the education department of the state, from schools of education in the state universities, from school building specialists, or from school administrators specializing in the school plant. Efforts continue toward establishing, in the Office of Education at Washington, advisory services and reference material covering the field of the school plant, including its design, operation, and maintenance. The services would be free and advisory only, and would not necessarily have to be accepted.

When the preliminary plan is finally agreed upon by the school authorities and has the blessing and understanding of the interested community groups, one of the biggest hurdles is passed. There follows the orderly process of getting the necessary approvals from such higher governmental authorities as hold jurisdiction, preparation of working drawings and specifications, award of contracts, and the completion of the project, all of which are more or less routine.

But the job is not done when the building is completed and turned over for use. It is only beginning, then, for the school administrator, for its continuing success depends upon keeping alive that spirit of cooperation and understanding. We have given to the community what it wanted. Community interest usually follows leadership, and that leadership to a considerable extent must be furnished by the school itself.

Designing the Central Rural School Plant As a Community Center

by

DON L. ESSEX

THIS talk was prepared with special reference to the central rural school. This type of school has many variations in organization and administration and goes by many names. It may be the township or combination of villages and township school as found in Indiana and other midwestern states. It may be the parish school as found in certain southern states. It is sometimes known as the consolidated school.

In New York State the central rural school is formed typically by combining a village district with from 15 to 30 rural districts which have a natural center in the village. Township and county lines are ignored. I know of one central rural district which overlaps seven townships and three counties.

This type of central rural school is, therefore, truly a community school—that is, it serves a natural community. The village is the natural center of the area for trade, for social affairs, for religion. The bank is here; here the doctor lives; here the farmers bring their agriculture tools for repairs. And here is the natural location for the school to serve the area.

There is a growing sentiment among our rural school people that in the central rural school district the school plant should be planned to provide not only for the educational needs, but also for many if not all the social, civic, recreational, and cultural needs of the entire community. It is felt that, if this can be done, in many instances inefficient utilization and duplication of costly building materials can be avoided. Furthermore many feel that, as the school and community draw closer together, interest in and support of the regular school program by the community increase accordingly.

I wish to present certain suggestions for planning the central school plant as a community center. I hope that you may find some, if not all, of the suggestions desirable. In no sense is this talk meant to be a planning guide. Rather, it is designed to call attention to the problem and to stimulate and encourage local school officials and architects to give thoughtful consideration to community needs in the preparation of plans for a new school plant.

Each community should study its own needs.—The first question to be asked is: What are the community needs which may properly be housed in the school plant? This question can be satisfactorily answered only in the community and by the community. State departments of education and state universities can give some advice and guidance, but in the final analysis the needs should be worked out locally under the direction of the board of education and with the cooperation of interested citizens.

In my judgment the superintendent and the principal should accept primary responsibility for guidance in this problem. They should be aware of, and should point out the possibilities of the use of school building facilities. While the community must sanction and approve special activities, leadership in this matter rests mainly with the local school officials.

Pattern of community needs.—As one talks with local school officials about this matter, a pattern of needs common to most communities takes form. Such community organizations as the following will need a suitable place for their activities: Grange, Farm Bureau, Home Bureau, 4-H Club, Red Cross, Junior Red Cross, Boy Scouts and Cubs, Girl Scouts and Brownies, parent-teacher organizations, service clubs, forums, and community athletic teams. Other groups can be named. In addition, adult groups may use the school plant for classes in homemaking, farm machinery repair, and physical education, and for other courses and activities.

Activities to be taken care of in the school plant—some connected with the foregoing organizations, others not—include: group meetings, banquets, dramatic entertainments, adult education classes, dancing, musicales, operettas, motion picture shows, the public library, and such games as basketball, volleyball, badminton, baseball, horseshoes, softball, ping-pong, and various other table games.

A Saturday "nite club" or "teen age canteen" for high school pupils, sponsored jointly by school officials, pupils, and parents, may offer a fine outlet for social and recreational desires. This club is properly housed in the school building.

Five factors.—Fortunately, few if any additional facilities over and above those commonly found in a well-planned central school building are needed to take care of these community activities. This does not mean that every well-planned central building—that is, well-planned for the usual in-school educational program—lends itself readily to community use. Far from it.

Rooms in the school building may be used dually by the school and the community. Five factors must be given careful consideration in planning these rooms, however, if adequate provision is to be made for the community needs. These factors are:

1. Location in the building of facilities used by the community
2. Distribution of heat for unit and room control
3. Provision for adequate storage space for equipment
4. Special appointments and service features
5. Provision for toilet facilities

1. Location in the building of facilities used by the community. So far as is practicable, the facilities used by the community should be so located, and grouped, (*a*) that they can be readily reached from the drives and parking areas (most of the people will drive to the building), and (*b*) that they are readily accessible after the main vestibule is entered.

The Cato-Meridian (N.Y.) Central School building is a splendid

example of the application of these two principles. The drive swings near the main public entrance and the parking area is nearby. On entering the main public vestibule one finds himself within a few feet of the entrance to the gymnasium, the auditorium, and the cafeteria. The agricultural shop is located below the gymnasium. (With the terrain falling away sharply, this room is entirely out of ground.) Thus rooms used commonly by the community are centered near the public entrance.

2. Distribution of heat for unit and room control. The heating system should, as a measure of economy, be so designed that the rooms used for community purposes can be provided with heat adequate for occupancy, while at the same time the rest of the building is maintained at a lower temperature. Separate steam mains can be run to such large units as gymnasium, auditorium, and cafeteria. Further, each room which will have community use can be equipped with a dual thermostat. After school hours the custodian can, by a single action, set all thermostats for night temperature. Then by pressing a button on the face of the dual thermostat in each room to be used after school hours, he resets that thermostat for daytime temperature.

3. Provision for adequate storage space for equipment. One of the key principles in planning a room for both school and community use is that suitable and adequate storage space for the equipment essential for the various activities should be provided. For example, the school cafeteria dining room can, if properly planned and equipped and if provided with suitable and adequate storage space, be a most useful general-purpose room. During the school day it can be used for such activities as music, dramatics, oral English, visual and radio education, and assembly of small groups. After regular school hours the room becomes invaluable for small group assemblies such as parent-teacher associations, farm organizations, and Boy Scouts, and for dances and other recreational and social affairs.

Usually the cafeteria dining room in a school of the size and character under consideration contains between 1,000 and 2,000 square feet of floor space. In order that it may be usable for multiple purposes, the cafeteria dining room should be completely separated from the kitchen and serving counter by a partition of permanent construction, should contain a small platform or stage at one end, should have thorough acoustical treatment, should be attractively decorated, and should contain adequate storage space designed specifically for the equipment that is considered essential to the various programs to be housed.

Let us take, for example, the use of this room for scout work. The three units of scouting should be considered—cubs, ages 9 to 11; scouts, ages 12 to 14; and senior scouts, ages 15 to 17.

Cub packs should have a place to keep the pack emblem and to store many articles which the packs may purchase in quantity for loan or gift to the dens. Included in the list would be paints, beads, bead loom, books on handicraft work, special handicraft tools, leather, reed, and clay supplies.

The character of equipment for scouts is going to be much influenced and perhaps the amount greatly augmented by the federal gov-

ernment's program of making surplus equipment stocks available to the scouts. In planning storage space for scouts, this program should therefore be taken into account.

There should be storage space both for the troop and for each patrol. For the troop, provision should be made for storing such items as wall tents, walkie-talkies, pails, lanterns, camp chairs, cooking gear, army trunk lockers, and outing tools. For each patrol, provision should be made for storing such items as ropes, first-aid equipment, signal kits, flags, and pup or explorer tents.

As a general recreation and social room for the community, the cafeteria dining room has vast possibilities. The room should be equipped with ping-pong and other game tables of various types, and with radio and phonograph. Provision should be made to hang wraps, and the room for this purpose should be so placed as to serve the gymnasium and the auditorium as well as the cafeteria. Here again it is seen that the location of these three units in close proximity to each other is of great importance.

The question of what to do with the dining tables and chairs when the room is used for purposes other than dining is a difficult one, and one that, if not properly answered, interferes seriously with multiple use of the dining room. Two means of handling this problem work out fairly well. One is to install folding tables and chairs and then to be sure to have adequate storage space for them. A better but more expensive way is to install a fold-in-wall type of table and bench. With this latter type of installation, the floor can be cleared after the lunch hour with a minimum of time and labor.

Another example of the need of storage space is in connection with the use of the gymnasium and lockers and showers by adults. These people, if they come regularly to the gymnasium, should have lockers in which to keep their gymnasium clothes and shoes. The present practice of providing six or seven small gymnasium lockers for each large compartment locker makes it fairly easy and inexpensive to take care of this need. All that is required is to provide each adult with a small locker, 7½″ by 12″ by 24″ for his gymnasium suit and shoes. He can place his street clothes in one of the large compartment lockers which have already been provided for school use.

It is not intended that the foregoing discussion of storage facilities should be all-inclusive. Many other examples of the need for storage space for community use of the school plant could be given.

4. Special appointments and service features. Certain appointments and service features, their character depending upon the community activity to be taken care of, should, of course, be provided. For example, with the increased use of the building at night, walks, drives, and parking spaces should be well lighted. Play areas and courts designed for evening use should be equipped with floodlights.

Another example is the installation of gates at the foot of stairs and at strategic points in corridors so that traffic in the building can be restricted. Care should be taken, however, that needed exits are not blocked.

5. Provision for toilet facilities. It is essential that adequate toilet facilities be available for the out-of-school use of the school building. With proper planning, however, two sets of school toilets, one for boys and one for girls, can be so located that they will be readily available to the three units that will see the greatest amount of general public use—the gymnasium, the auditorium, and the cafeteria.

With one exception, there is not much justification for providing separate toilets for out-of-school use. The exception is the need for toilets that can be reached directly from the outdoor playing fields without entering the main part of the building. This is a very definite convenience, particularly as the playfields are frequently in use during times when the building is closed, such as late evenings, Saturdays, Sundays, and other holidays, and during the summer months. Drinking fountains should also be provided.

Custodial service.—Another matter which, while not related directly to planning the building, is an important factor in the use of the school building for community purposes is custodial service.

The question of payment for custodial service when the school plant is being used for community purposes is a troublesome one. In some places the organizations using the building pay the custodian for his extra service, which usually consists of opening the building, staying on duty during the activities, and then locking up after the activity is over and the people have gone home.

The more common practice is for the school board to assume full responsibility for custodial service for out-of-school activities. With the increasing use of the school plant for community purposes, this is becoming, and should become, the universal practice. Specific, written rules, insuring consistency, should be adopted.

In a school building with a single janitor, the janitor may need an assistant to look after the community use of the plant. This assistant should be employed by the board and should be responsible to the board. If the heating system has automatic controls such as may be found with an oil burner or a coal stoker, the assistant need not be skilled in firing a furnace. He should be a sober, responsible person who can clean up and straighten around after the activity is over and who can be depended upon to protect school property.

Looking after the plant during community activities need not in all cases be an extra expense. Many times it will be possible to schedule regular cleaning work during the late afternoon and evening, so that the custodian performs the dual service of carrying on his regular work while he keeps part of the building open for community use.

The shifting of equipment in a room used for a variety of purposes requires careful planning by the custodian. For example, in the cafeteria dining room the custodian's schedule should provide for clearing the room of tables and chairs immediately after luncheon and for sweeping the floor. The room is then ready and available for other activities until just before the lunch hour of the next day, when tables and chairs must be again set up.

Another example relates to taking care of toilets which are used by both school and community. Scrupulous care should be taken that, after every community affair, the toilets are thoroughly cleaned and made ready for school use the next day.

Cost.—One of the most gratifying aspects of planning a school plant for community use is that but little extra cost is required. Few, if any, extra rooms need be added. We made a very careful study of the plans for the Cato-Meridian building and estimated that to make the building suitable and adequate for community purposes as discussed in this paper would mean an extra cost of about $5,000. The Cato-Meridian building cost $516,000. Therefore, the increase in cost due to planning of the building for community as well as for school use represents an increment of only about 1 per cent.

The cost of custodial service and, of course, of operation of the building will be increased, but with careful planning the increase can be held to a low figure.

In appraising the extra costs involved, it should be realized that separate plants to take care of school and community needs would, both in construction and operation and maintenance, be far more costly. The tax dollar yields more if the school building has both school and community use. Moreover, rich dividends are gained in community interest in and support for the school.

Changing Trends in Education Significant to Problems of School Building Planning

by

HENRY LESTER SMITH

ONE who speaks of trends in education should be somewhat guarded in his statements lest he be accused of wishful thinking. What we sometimes take to be a trend is merely a mirage, and disappears. A change or variation which in a particular community may seem important may have no general significance. On the other hand, a variation from the customary may seem of slight significance, yet start a movement significant enough to be called a trend.

In the field of education we have many experimental deviations. Some of them soon die of inanition. But occasionally a new method, a new plan, a new kind of material or type of building proves to be useful, and gradually there develops a trend toward a general acceptance of the new. Very seldom in education do we have a sudden shift from the old to the new, from the tried to the untried. Generally speaking, education in a democracy is slow-moving. In some cases it would seem that rapid acceleration would be highly desirable. On the whole, however, it is fortunate that we move slowly, that we have trends rather than sudden revolutions. Trends usually show a tendency or an attempt to meet a known social need, and, to meet this need, careful thought, planning, and preparation are ordinarily essential.

From the standpoint of schoolhouse construction it would seem necessary at this time, as we face a new situation and must meet new problems, to list and consider some of the trends in education and to seek to ascertain what bearing these may have on the planning of new schoolhouses.

It will be noted that all the trends we list in the educational field as being significant for future building plans are trends toward both expansion and flexibility. These two areas of building problems are closely allied, sometimes even interwoven. The one is largely a trend toward the expenditure of more money for additional facilities to obtain more desirable results; the other is largely a trend toward getting desirable results by a process of shifting, manipulating, and increasing the use of the facilities provided.

Flexibility may be defined as the capacity to be changed, to be adapted to multiple uses, to contract or expand, and to assume different shapes.

Flexibility in the area of school buildings is a construction such as will lend itself to changes in size, arrangement of rooms, additions and subtractions, shifts in use to which the rooms or the total building may be put, shifts in coloring and lighting of rooms, capacity for being used for heavy or light materials, and the like.

Flexibility in any particular school building does not "just happen." It must be *planned for* and *built into* the edifice. The capacity to be used for different purposes or in different ways is always a planned capacity. If a building has to be remodeled to be used in various ways, the quality of flexibility was not there originally but has to be added. The present-day trend is to put into every new school building as much of the quality or capacity of flexibility as is possible without being out of line with a satisfactory degree of beauty, economy, and stability.

In some of the areas where trends in education are noticeable, some illustrations of the necessity for expansion and flexibility may be given.

Of the trends we have selected to consider here, four seem to be general. They are common to all states, receiving, of course, greater emphasis in some than in others. They are all of universal importance.

The first of these general trends is toward setting up higher, more definite standards in every area of education.

This trend may be in part the result of the spirit of rivalry among the leaders in the various subject-matter fields. But it has back of it the feeling of nearly all teachers and administrators that education in all its fields has not by any means reached the goals it should and could meet; that in every field education should be on the march toward higher goals and greater efficiency. It has become more and more evident to leaders in education that it is absolutely essential that we first *set* higher goals in order to *reach* higher goals; and that our standards be not only movable but actually moved higher from time to time. There is the tendency also to make the standards much more specific and more complete. An illustration of this may be found in a set of standards soon to be published by the Department of Physical Education of Indiana University. These standards cover in detail the various phases of the field: health, safety, recreation, etc. They cover also the types of equipment, the necessary facilities, the proper buildings and grounds, and various other items.

Standards similar to these may be found in many other subject-matter fields. Comparisons are being made, and from time to time changes upward are advocated.

The fact that standards are being steadily revised upward has heavy implications for schoolhouse construction. When standards are set by experts and are known by administrators and teachers and even by the community, it follows that school buildings must be planned specifically to meet definite and exacting standards. For example, in the matter of laboratories in physics, chemistry, and agriculture, the results of research and the development of new products will demand new types of equipment and facilities and additional and rearranged floor space. It is to be remembered that in all areas there is not only a five-year accumulation of deficiency in new schoolhouse construction, but a five-year accumulation of ideas, discoveries, and inventions.

Another trend closely akin to the one discussed above is a marked tendency to place all levels of education upon a parity of importance in matters such as quality of teachers, quality and adequateness of facilities, and curriculums.

Some years ago it was a too common notion that the elementary schools were of less importance than the high schools; that almost any kind of building, equipment, or even teacher, was good enough for elementary schools. Standards of excellence were rarely heard of in this field. Sanitation, safety, comfort, convenience were given comparatively little consideration. Equipment was as meager as the methods of teaching were static. Gradually a change in attitude has come, so that today a most decided trend appears to lift the status of the elementary schools to a parity with that of high schools.

This trend will of necessity mean expansion of building programs. But it will mean more; it will mean modern plans to meet modern standards for elementary school buildings. Child life, child interests, and child welfare have come to hold such a high place in the public regard that nothing but the best in modern facilities will satisfy the community.

Still another general trend is that toward recognizing that all localities and all segments of the population should be on a parity in educational opportunities and facilities.

This trend has greatest significance for rural and poorer districts. State aid and federal aid will bring demands for consolidated schools planned especially for doing a definite type of work. Planning buildings for rural consolidated schools is a task that calls for far-sightedness and some real ingenuity. We have scarcely scratched the surface in designs for adequate buildings in which to carry on a well-rounded, essential rural program. The field is practically unworked from the school building plans standpoint in so far as really meeting the new concept of rural-school needs is concerned. Great expansion in building in this rural field is almost certain. The chief problem will be to get a proper conception of the developing needs and to be able to meet these needs through suitable and adequate planning of buildings.

The fourth general trend is to recognize more fully that the schools belong to the community and are a community investment and enterprise, and that the buildings, grounds, and equipment of the schools should be made available to the public as far as possible without conflicting with the school program.

Naturally this trend will break some hoary, traditional methods in administration. It will call for the burial of some antiquated notions, but, if carried through, it will be of great benefit to both school and community. In this movement, again, both expansion and flexibility will enter into the picture.

In this case there is definite need for flexibility in thinking as well as in buildings. Heretofore, schoolmen have too often taken the attitude that the schools are an independent unit. But the people of the community are knocking at the schoolhouse door and demanding that they be sharers in the privileges and facilities of schools. They are claiming, and rightly, that they pay the taxes, construct the buildings, pay current expenses, and even, through their own school board, hire and pay the teachers. In order to meet this just demand, both school personnel and school buildings will need to become more flexible. Planners of school buildings will need to take account of the fact that

school programs and community programs will have to run simultaneously at certain times and, at other times, one following another.

In addition to these four general trends, we should like to mention a few others which have to do with particular areas of the educational field.

The first is the trend toward a fuller recognition of health, both physical and mental, as one of the most fundamental problems in the field of education. Generally speaking, the people are aware of some of the facts revealed by Army and Navy examinations and training programs. Hundreds of thousands of young men were rejected; many thousands more were accepted but later had to be hospitalized or discharged. The astounding facts and conditions revealed have led to a determination to develop a health and physical education program which will be both preventive and remedial. Such a program, when it gets under way, will demand an expansion in buildings and grounds and equipment unparalleled, perhaps, in our history. The expansion will be greatest in the elementary field, where neglect of health and recreational facilities has been most noticeable. Gymnasiums, play rooms, and swimming pools, as well as outdoor facilities will be demanded.

In the vocational area there is a rather rapid trend or movement to provide a much wider offering in vocational subjects and a much fuller training in a wide range of vocations. One can scarely vision the expansion in this field or the types of building plans that will be called for.

When we consider the demands for training both sexes in so many different areas, each one of which calls for different construction plans, we can have some idea of the size of the task before us. In the two big fields of industry and agriculture, the amount of floor space necessary to carry on proposed programs will seem to many to be unreasonably large. There will be less flexibility possible, perhaps, in buildings for these areas because of the necessity of installing heavy tool machines and housing large types of self-propelling machines such as tractors, airplanes, trucks, bulldozers, and numerous large farm implements.

We have time here to mention only a few other trends significant to schoolbuilding planning:

1. The trend in the construction of buildings, and also in landscaping of grounds, to strike a sensible medium between beauty and utility
2. The trend toward higher standards in the matter of accessibility in buildings, rooms, equipment, and playgrounds
3. The trend to provide for adults a larger number of courses in more fields and at less cost than possible heretofore
4. The rather rapid trend toward a greater use of audio-visual aids at all levels of education and in practically all subject fields
5. The trend toward giving a larger place to fine arts and industrial arts in the public school program
6. The trend to take a long-time view of building needs and to lay more emphasis on the expansibility and flexibility of buildings

All these various trends we believe to be of significance in our

facing of a heavy building program. It would seem that no one of them could well be ignored in our school building plans. The list is not exhaustive, of course, but may be sufficient to show the nature and size of the task which faces those who seek in school building planning to meet as adequately as possible the needs of today's and tomorrow's children and youths.

In the attempt to keep in line with all these significant trends in education and to be prepared to meet the demands of a rapidly expanding program, it will be necessary in school building planning to lay a lot of groundwork and to work out and establish as soon as possible suitable standards in all areas so that, when construction of public buildings receives the "go-sign," work can begin immediately.

In the fields of vocational education and adult education, developments would seem to indicate that there will be many new demands and new problems. The tremendous strides in science, in inventions and discoveries, will make it necessary to retrain large groups of workers in different fields. This task in instruction and in providing facilities will fall upon the schools.

In connection with our study of trends and of the expansion necessary in the various fields, it might be helpful to give some examples, from different areas, of the quality we have called flexibility.

In the area of health and physical education may be found several examples of putting the quality of flexibility into school buildings.

In a high school gymnasium in a neighboring state, there is a room, centrally located, used for multiple purposes. It is used by athletic teams as a lantern room where pictures of plays are shown; it is also used as headquarters for the Library Club. Wall cases are provided for book selections. At times it is used as a classroom for instruction in team plays.

Another large room in this building can be put to various uses. It has provision for vigorous varsity sports, it is available as an exercise room, it provides equipment and space for classes in restricted activities, and, by bringing in mats, it may serve as a wrestling room. It is also available to the Boy Scout troops for training and instruction.

In another part of the building is a regular wrestling room, separated by a partition from a larger recreation room. In this wrestlers' room there are observers' bleachers. The sliding door partition opens this room into the larger one, making space for various activities of large groups.

The large gymnasium room itself gives an example of flexibility. Besides the regular long court, it has cross courts, providing opportunity for several games at one time. There are also folding bleachers easily put back out of the way when certain activities are in progress.

Many nursery schools are making use of the principle of flexibility in meeting the problem of handling groups of children in rather limited quarters. For example, in some schools there is a central room which serves several purposes. In the first part of the day it is used as a play and work room. Then it is changed into a dining room where the noon meal is served. Then cots are brought in and the room becomes a

bedroom. After naps the cots are folded and removed and the room is used again as a play and work room.

Primary school rooms in many cases furnish examples of flexibility. The classroom is the home room and, by certain shifts, becomes the play and work room, a lunch room, a rest room for the rest periods, and a physical education room. Movable furniture is provided, and equipment can be shifted. A toilet room is also provided. The room is in many ways an independent school unit. In the Winnetka type of primary room, a door opens to an outside court or playground where outdoor activities are carried on.

In the plans for vocational buildings, a certain amount of flexibility will be called for. For example, in a new industrial or agricultural shop for a high school there may be no immediate need for a heavy crane for handling big, heavy machines. However, it would be wise to provide the requisite heavy overhead construction so that at a later time a large crane could be installed.

In airplane shops and in agriculture shops the walls should be so constructed as to permit the installation of exceedingly wide doors for the entrance of wide-winged airplanes or wide farm implements.

As an illustration of a setup in a particular field where great expansion and flexibility of building plans will be necessary, we might cite the area of audio-visual aids.

In this area the functionalism theory seems to be dominant. All material of library-visual aids, audio-aids, and museums should be convenient to both teachers and pupils.

In each city or town there should be an audio-visual aids center, under one director, from which materials of all kinds may be distributed. Sub-units in each school (elementary and secondary) should also be provided.

Many administrators now feel that in each school there should be a room where pupils may take visual-aids material and use it, and that desks with electric outlets should be provided for individual pupils, so they may use earphones and screen.

Each classroom should be adapted to all types of material: sound films, radio, exhibits. Proper acoustics, drapes, and shades must be provided. Each classroom, it is now being claimed by some, should show one film, one period a week, in each subject.

For such work and for exhibits the classroom will definitely have to be enlarged.

In each school building there should be a miniature auditorium, perhaps three times the size of classrooms. This room will illustrate definitely the principle of flexibility and will have the following uses:

1. It may serve as a supplementary music room.
2. It will provide a place for three or four classes to observe important films.
3. It can be used for the preparation of broadcasting material.
4. It may serve as a broadcasting room, and a place for hearing F.M. programs.

5. It may be used for P.T.A. and other community meetings. It should therefore be accessible from the street.

6. It should include a control room, and be equipped to make motion picture records for classes.

In large schools there should be a large auditorium equipped thoroughly for showing films to large audiences either of school population or of adults.

In halls and corridors there should be modern exhibits that are changed frequently and are under the direction of a competent individual acquainted with the visual-aids field.

The possibilities in the fields of physical education, nursery and primary education, and audio-visual aids, as they have been presented, will serve to indicate the degree to which flexibility may be required in future building construction. If time permitted, other areas of education could be selected for further illustration. These illustrations may best be brought out in group discussion that might follow this presentation.

In conclusion, may I frankly recognize that the discussion thus far has been a piecemeal one, not logically and comprehensively built. It is a mixture of numerous generalities sprinkled with limited specific and illustrative matter. A well-rounded discussion has been unattainable, partly because of limited preparation time but more largely because of darkness of vision in the area. The one conclusion I wish to leave is this: the perfectly planned and used building need not be sought, for it does not and cannot exist. A finished product or task represents at best a static situation, hence necessarily a situation bordering on the edge of disintegration and decay both physically and functionally. Our best hope is for a struggle for as nearly perfect and comprehensive goals or educational purposes as possible, recognizing the inevitable and constant pressure for change that must be expected of every growing organism or institution. When this is done, we should struggle for two things: first, to reach those goals, and second, to reach them without at the same time dragging in their wake disintegrating or dangerous by-products. A goal reached is not necessarily a desirable achievement. It must be an accomplishment unhampered or unscarred by unlooked-for and deleterious accompaniments, and an end with adequate provisions for the shocks of certain growth pressures that demand continuous change. Goals change. Hidden and undesirable by-products unexpectedly appear. Moreover, these changes demand constant revision of educational standards and procedures. The school plant, with its equipment, is therefore constantly under the necessity of modification and improvement. Change is therefore imperative, and our vision of the adequacy and flexibility of structure and function is a continuous and changing problem.

Current Problems in School Building Construction

Panel Discussion

Wilbur B. Shook: The educator, the builder, the engineer, and the architect are confronted with a major problem in the construction of schoolhouses in the immediate postwar program. This offers a challenge that will be met with their combined abilities, experiences, and ingenuities. It has been done before and can be done again.

A tremendous schoolhousing need exists primarily because of building inactivity during the past five years and a potential increase in school population. In face of this demand, the construction industry is struggling with delayed reconversion, unsettled labor conditions, and a very lean material market. However, all these conditions should be improved by mid-year.

Building costs are higher—approximately 60 per cent above the 1939 level—and will undoubtedly go higher before they decline. As of January, 1946, schoolhousing is being estimated at 65c to 75c per cubic foot. Ways and means must and will be found to meet this condition.

In addition to alterations of the bonded limits for construction of state schools, we believe, in many instances, federal and state assistance will be needed. As architects, we are doing all in our power to offset this high cost to some degree by economical planning, although an appreciable saving from this source is difficult because school requirements are such that probably a great deal cannot, and possibly should not, be altered.

Our feeling has always been that school buildings should be designed on the premise that fundamental principles of good school planning do not, and probably should not, change rapidly. Every school must primarily provide the utmost in safety, sanitation, and health, and each planner must recognize educational planning for more than just a cluster of uninteresting classrooms and accessory spaces.

There is one thought I would like to give you for discussion, if it seems to be of sufficient moment, and that is that more consideration be given to the one- and/or two-story, open-type school building, particularly for elementary grade schools, rather than the block-type multi-story building. This may result in some saving in cost, although this is yet to be proved.

Where site and acreage permit, the low-story type building can be used. It provides for better expansion, both internal and external, for a more inviting and friendly atmosphere for the children, and a more neighborly center for adult community use. This type has been planned, constructed, and used successfully in other sections of the country, usually where climatic conditions are not as rugged as in the mid-west, although a modified form can be followed here.

Some advantages offered are a minimized fire and panic hazard; elimination of stairways and basements; lighter foundation and superstructure; classrooms of varying size and shape; use of bilateral or clere-story lighting; larger glass area with lower sills, and doors leading directly to play yard; toilets accessible from play yards as well as corridors; better zoning possibilities for different departments of school, particularly for community use; more flexible room spaces for multipurpose, with the possibility of panel or radiant heating in the floors; and the opportunity to resalvage considerable material should the building become obsolete or major additions or remodeling be advisable. Architectural opportunities are presented for designs of a functional modern style with the use of native materials making a very inviting and pleasing community type school building which will adjust itself and settle into any rural, suburban, or neighborhood residential grouping. Buildings of the future should not be "institutional" or forbidding in appearance but, to the contrary, should be friendly and interesting for both the children and the community. Further, this type of building offers the possibility of planning the entire school or, if funds are available for only part, of such portions as need be built. Some of these features would require Code changes.

With the new State Rules and Regulations for Administration Building Council (so ably directed in their preparation by Clarence Myers, promulgated by the last session of the Legislature, and now being directed in a spirit of fine cooperation by Mr. Westover), a new opportunity is presented for Indiana architects to be permitted an expression for individuality and newer thinking in schoolhouse construction. The rules and regulations represent minimum requirements and can be changed by request, with sufficient supporting evidence, upon the approval of the A.B.C.

A rare opportunity exists for all of us to work together to cope successfully with these construction problems and, out of our efforts, to create for the children a safe, sanitary, healthful, pleasant, inviting, and educational building and environment.

LUTHER LOCKWOOD: It might seem facetious to say that every problem that can possibly arise relative to a school building program is a problem of the superintendent, but it is nonetheless true.

William Lyon Phelps said that the greatest six-word sentence outside the Bible is "To be or not to be." It seems to me that one of the very crucial problems in the area of school building problems, to which every superintendent must find a definite, clear, and unequivocal answer, is "To build or not to build." The degree of difficulty with which the answer can be found will vary in different communities. In some places a good look at the school plant will produce the answer, but in others only after a careful and critical examination of the plant, the curriculum, the general philosophy of education, the trends, the growth, and various other aspects of the general educational situation as well as of the community as a whole can the correct answer be found.

There is perhaps nothing that will jeopardize the educational

leadership of the superintendent in the community so much as his failure to grasp correctly school building needs. If he proposes plant expansion without carefully prepared and weighty evidence to justify it, he soon loses face, and, on the other hand, if he fails to exercise aggressive and courageous leadership in behalf of modern school facilities where the need is readily discernible, he is sunk. His sins will not only find him out but will finally catch up with him.

If and when the data are assembled and the decision made to build, then the problems come so thick and fast that only the wisdom of an educational Solomon will see him through.

What is to be incorporated in the new building? Just what is it to be when completed? Planning for a modern educational unit, regardless of the grade level for which it is intended or the department it is to house, requires more than provisions for walls, floor, and roof. It is the embodiment of an educational philosophy as to what constitutes a modern forward-looking educational program that is necessary to equip youth to live in an age of changing patterns of life. This educational blueprint which the superintendent must hand to the architect to objectify with brick, steel, cement, etc. is a problem of the first order. It will determine the kind and quality of educational experience offered boys and girls to a far greater extent than will the work of the architect.

Among the many other problems that face the superintendent in a building program are:

1. Choosing a site
2. Selecting the architect
3. Cultivating proper public relations to win support

Of the many other problems, probably the most important one is financing. In Indiana the great majority of school corporations are unable to finance at once their school building needs, because of the limited bonding capacity and present indebtedness created by previous building programs. The limited bonding capacity of school units could be materially increased by a reassessment of real estate based upon reasonable current values. The present high costs of construction in both labor and materials reduce the purchasing power of the funds available, but the bonding capacity has remained static. The poor and inadequate buildings that cover the state today are the result of "shoestring" financing. They have tended to freeze the educational program on an inferior level and have impeded progress and changes that are vital if our schools are to serve our youth adequately.

The postwar building fund which is now permitted offers some relief, but even the establishment of an adequate building fund requires time and tends to retard the building program. With limited finances, I doubt whether there is even one superintendent present who is not waiting expectantly for Uncle Sam to make his contribution.

A most perplexing problem arises when consideration is given to the availability of building materials and equipment and the inflated costs of construction. Would it be better to postpone building until costs have come down, if and when they do, or is the need so urgent

that nothing must stand in the way of the program? Doubtless every community will take sides on this issue.

"To build or not to build" is a many-sided question, and is surely a difficult current problem.

WILLIAM E. MOHLER: The suddenness of World War II brought on a period of planning and building concurrently; in fact, in a great many cases buildings had to be constructed and plans made afterward in order to make a record. This is a condition that should prevail only in an emergency such as war. We all recognize that this is a costly procedure, but cost cannot be the determining factor when it is necessary for us to protect our lives and our country.

During the war period, large construction projects were conceived in a day, architects and engineers were employed to start the plans, contractors were ordered on the work at once, and the project was constructed within a few days in a great many cases. Owners whose building opportunities have naturally been retarded during the war might now wonder why such speed cannot be employed in their much-needed additions or new building construction in the postwar period.

The tendency today is to do as we did in the war—plan and build at the same time. But you must remember that such procedure is very costly and in most cases projects so conceived and constructed result in ill-planned work and great waste in construction costs. With this reconversion going on and adjustments being made in various materials used in construction, and in most cases, with severe shortages, now is the time for the prudent builder—be it private owner, board of school trustees, or otherwise—to give time to the proper preparation of plans so that he may have all the ills worked out and the studies made of the workability of the finished building. This enables the contractor to make more accurate surveys of the quantities of materials required; it provides a more accurate basis for him to design his layout for construction, which involves all the equipment and facilities that are necessary; and, especially, it provides an opportunity for scheduling the work and preparing it for delivery in the sequence required. We, therefore, cannot urge too strongly that the preparing of plans, even for work that may not be constructed for some time, be done now.

Another matter, of course, that is important to the contractor is the more liberal interpretation of jurisdictional matters by the various trades involved in the construction of buildings. You will understand that most of the work today is constructed with organized, usually termed union, labor, and the contractor has to deal with 19 different organizations in the construction of the ordinary building. In most cases the contractor is not so greatly concerned about which trade might do a certain piece of work; the argument which causes delay, confusion, and cost is usually brought up by the rival union organizations. For instance, at this time there is no definite settlement as to who should put up acoustical work. There is usually an argument as to who should set up a metal door and frame in a building, and the contractor naturally seeks from these organizations a little more liberal tolerance in these jurisdictional matters.

At this time, and it may be the case for some time to come, it is almost impossible for any contractor to give a firm and positive bid on work because he cannot get a definite and firm bid on materials required, either from the material dealer direct or from sub-contractors. This is occasioned at this time by the unsettled labor prices throughout the country. We do not know, when we are bidding on a job that requires considerable structural steel, whether we are to pay the same base price as exists today, whether we are to pay the $2.50 per ton increase that OPA is talking about, or whether we will have to pay the $6.25 increase that is asked by the steel companies. Therefore, in private construction, most of the work is being done on a cost-plus-fixed-fee or cost and percentage contract in which the contractor has given the owner the estimate of final cost based on the best information he is able to obtain at this time. Perhaps some concern should be given to the laws regarding firm or lump sum bidding on public buildings in a period of this kind. It is more practical for you to construct them on a fee basis while these conditions exist.

A contractor with sufficient ability to coordinate and properly handle your work and do you a good job of construction must also protect himself against the odds he might encounter in your construction. He can only bid on the safe side, prepared to meet the uncertainties at the worst, as he knows that, should he get a more stable market, he would promptly pay his excess profits in taxes; but, should he not provide for the instability of the markets and encounter losses, it would take him many years to regain what he has lost.

CLARENCE T. MYERS: The physical problems of school construction, as far as materials are concerned, are very much like those of any other type of construction. This was brought out by the January 18th Housing Conference, called by the Governor at Indianapolis, which emphasized the fact that practically all of our problems at the moment are due to shortages of material. This situation is slowly correcting itself, as we all know, and most of the materials required in school construction will be available during the summer and autumn, we hope, in reasonable quantities.

As a representative of the Policy Committee of the Indiana Construction Industry, I wish to mention some features, of service and value and of recognition by this conference, worthy of comment. The Policy Committee is made up of some 18 industrial organizations which send elected delegates to this central organization. These organizations, pulling together through the Policy Committee, have proved their effectiveness in legislative affairs.

We wish to call your attention to some legislation directly affecting school planning and construction.

Perhaps the most valuable contribution is that of the Revolving Fund, which was known as House Bill 372, presented by Miser and Henley of Bloomington. This Bill created a $500,000 Revolving Fund for purposes of financing the designing of public structures. This money is loaned on a five-year plan to local units of government for planning purposes. At this date, the Economic Council says that ten applications

for school planning have been approved and that ten are on file. The fund has been exhausted, but no doubt will be replenished at the next session. This might be the subject of a conference resolution.

The next item of legislation influencing school planning and design is the Enabling Act, known as Senate Bill 121, presented by Beaman and Fleming, which enabled political subdivisions to make use of federal funds. This money is a loan to be repaid out of local funds when the project is actually constructed.

Mr. Pike states that 12 school buildings have been approved and that 11 are "in the mill," making use of funds of the Federal Works Agency Bureau of Community Facilities. It is of interest to note that almost 50 per cent of the federal funds have been allocated to school use and 50 per cent to other types of construction and improvements. It might be suggested that, whereas the Revolving Fund of $500,000 is limited and depleted, the federal fund can carry on from there.

There is also a provision that buildings planned with federal funds be built within four years, but this limitation is flexible. Indiana University has some 21 applications for various types of buildings approved under the Indiana Revolving Fund.

Other legislation in which the Policy Committee was interested at the last session was the re-enactment of the Administrative Building Council law, which is the background organization for our State Building Code. The section in the code on group "C" buildings pertains to school regulations, and was an effort to reconcile state school laws—mostly under the old schoolhouse sanitary law—with other recommendations coming through the Uniform Code and the Connecticut School House Code. In the present code, the statement is made that Volume 5 is to be published more fully, defining school building regulations. The contents of this volume were discussed and reviewed at a conference at Purdue University some months ago. At that time, it was the intention that these rules and regulations would be placed in printed form, and it is our hope that this will still be accomplished shortly, in keeping with the original statement of intent.

The Policy Committee, as you see, is greatly interested in any and all problems of construction, including our educational buildings. If our Committee can be of practical assistance in carrying forward to completion any program planned by this conference, we shall be happy to be informed of any such possibilities of cooperation.

CECIL A. GRAYSON: The superintendent of schools must be a super-salesman. He must sell education to his board and to the general public, not just as the casually accepted something nice to have, but as a necessary and vital *must*. Furthermore, he must sell them the modern trends in education and must motivate them on their obligations to see that the schools provide these richer offerings and more efficient methods of instruction. It is his duty to sell the importance of and the necessity for modern, up-to-date, specially-planned buildings—buildings that are commodious, well-equipped, and designed to offer the most in convenience and service. He must establish the need for alterations or additions in existing buildings or for new buildings to replace or to supplement the

present ones. He must sell his people the school as an agency for community service, and must make them see the importance of community planning to that end.

In a building program, the superintendent is the hub about whom the activities revolve. It is his task to see that the legal requirements as to financing are met, such as action by the board, the petition for a bond issue (by 51 per cent of the free-holders), the advertising, the issue and sale of bonds, and the keeping of the financial accounting for these funds.

It is the superintendent who is best versed in the needs of the school and the services which should be built into the structure. He should, in collaboration with his board, his teaching corps, and the planning committee, prepare in advance for use by the architect sketches of plans setting forth these functional services in detail. Then, after the architect has prepared the blueprints and specifications, the superintendent should check these with the architect to make sure that all the desired functional services have been provided for. This checking should be done before the plans and specifications are presented to the state boards for approval.

Another important decision which finally rests with the superintendent is the selection of the building site. In arriving at this decision, four potent points must be given careful consideration—location, size, appropriateness, and aesthetic possibilities.

Now, to come more directly to the definite point in our topic, "Construction," we shall consider two of the many problems. First is the problem of financing.

It is a sad commentary upon the confidence that the public of Indiana has in its public officials that building programs of our local governmental and municipal corporations must be financed on debt. The constitutional limitation on bonding, inclusive of all bond issues outstanding at any one time, is 2 per cent of the assessed valuation of the corporation. For some corporations this spells *impossible*. In Lake County there are 14 corporations under county school supervision. Of these, only two have a bond limit in excess of $100,000, and five have a limit less than $50,000. On August 1, 1945, only one had available bonding capacity in excess of $65,000, and one had less than $8,000. This latter corporation has a school population in excess of 1,800 and needs additional building to the amount of $200,000. Many school corporations in Indiana have less bonding reserve, and some even less bonding capacity when unencumbered.

In another corporation in Lake County there are 525 pupils. That corporation is now constructing a new building for which the contract is $108,358.50, only $40,000 of which was contributed by the local corporation, which was its all. Who was Santa Claus? The Federal Works Agency. This case and many others in Indiana total up to the fact that there are in Indiana many school corporations which must be assisted if they are to finance buildings which will provide facilities to enable their schools to offer their children a standard, up-to-date, modern education. Who will be Santa Claus to these poor corporations?

In the corporation just discussed, about 95 per cent of the heads of

the families are employed in the city of Gary. Also, in the city of Gary they spend probably 95 per cent of their incomes; but they look to the rural area to educate their children. Yet the solution is not incorporation into the city of Gary; for on one side, they moved there to get out of the city, and, on the other side, you could not expect the city of Gary to induce to itself such a liability.

Neither does the solution lie in transferring. If all pupils were transferred, the cost in excess of the incomes of the corporation would be $24,000 each year. If all high school pupils were transferred out and all elementary pupils were kept in township schools, the net cost of educating all of the 525 pupils would exceed the taxes by less than $9,000. This saving to the state of $15,000 a year, would amount in ten years' time to the cost of a $150,000 building.

In answer to the question as to who should be Santa Claus to such corporations in their building programs, it is my thought that:

1. The education of its children is the state's obligation.
2. To ask the federal government is only to "kid" ourselves, for:
   Who contributes to the federal fund?
   Would the federal aid to our state be equal to our state's contribution to the federal fund for this purpose?
3. Do not large surpluses exist in all state treasuries?
   What is the condition of the federal treasury?

All who have had experience with building under federal grant know that the agency's standards are not up to the school standards in Indiana.

The practice in the past, as well as largely now, is to erect school buildings of a monumental type that have in time been found to be "white elephants." The great need in school building construction today is a type of building:

1. Whose cost is low enough that the investment would not make it prohibitive to scrap the building when it has become archaic.
2. Whose construction is such that it will lend itself readily and cheaply to alterations that would provide for adjustments necessitated by the ever-changing trends in education and the growths or shifts in school enrollments.

In the planning of a building that will meet these ends, I would offer for your consideration the following suggestions. (Please bear in mind that I am speaking from the standpoint of a county school system, where the cost of ground is of minor consideration.)

1. The building should be a one story, thus the structure of the entire building will be lighter and cheaper.
2. The floor should be concrete poured on a fill at least one foot above the grade line.
   a. This would be cheaper by half than the supported or spanning floor.
   b. It will insure dryness and an even temperature.
   c. To console the skeptical an ordinary insulating board may be mopped in above the concrete at a slight cost.

3. The roof should be supported on a low arched truss that spans from outer wall to outer wall.

a. The outer walls need be comparatively light narrow pilasters with the intervening part of light insulating material, possibly one of the several prefabricated types.

b. Similarly, the inner walls will not have to be load bearing.

c. This makes possible the use of movable partitions, several kinds of which are now available.

d. This type of roof makes possible large rooms with unobstructed space.

4. The ceilings should:

a. Be supported by bow trusses of the roof.

b. Be of a material that is insulating in respect to heat and sound and that also possesses some acoustic properties

c. Be only nine feet above the floor. This would permit a further lightening of the pilasters. To meet the requirement that there be for every pupil 225 cu. ft. of air space, the floor space must be increased to 25 ft. by 40 ft. for 40 pupils. This enlarged floor space is what the modern trends in education require. The modern teacher prefers floor space to overhead space. Also, low ceilings are conservers of heat and of artificial light when needed. If artificial light is needed in the inner portion of a room, the cost is more than compensated for by the saving in heat.

5. The windows should be only 30 inches (or if modular, 32 inches) above the floor.

a. Thus the requirement that the window space be one sixth of the floor space is readily met.

b. Thereby the light is down where the pupil sits.

c. It creates a more cheerful room (not so prison-like).

I wish to call attention to a possibility offered by this type of building construction. Whereas the cost of the heavy-type of construction has forced school authorities to the policy of housing the school in one large centralized plant, the lighter, cheaper construction will permit a decentralization of the plant.

1. By decentralization, the adult classes in shop, home economics, agriculture, and music; meetings of P.T.A. organizations, band boosters club, Future Farmers of America, Boy Scouts, and Girl Scouts; and independent basketball, legion plays, and such, can more easily be accommodated and provided for.

2. More important, decentralization makes for more spaciousness, more service, more light, more air, and more possibility of expansion. By careful planning, protection from the weather can be provided at a small cost for traffic from building to building. In like manner the heating cost can be held down. Also, the whole becomes one large, closely knit plant.

I believe that we are entering an era of a different type of school plant. It will be a plant of a lighter and less costly construction, decentralized, more commodious, more alterable, more adaptable to modern trends of education, and more serviceable to community activities.

Estimating the School Population to Be Served

by

HAROLD E. MOORE

DURING the past five years the public, and school leaders in particular, have been beset with frequent articles, headlines, and publications concerning the increase in the birth rate and the consequent upward trend in the school population.

In general, these pronouncements have dealt with the problem on a state, regional, and national basis, and frequently they have been discussed in such terms as to mean little to a particular community and school situation. Such statements as "the birth rate per thousand in the United States was 16.6 in 1933 and 22 in 1943," or "1,000,000 more six-year-olds will enter school during 1949-50 than entered in the early 40's" are more likely to confuse than to inform many local communities.

Certainly a fact like the last one just presented, which indicates a 33⅓ per cent increase over the 3,000,000 children now entering school annually, calls for examination of the local situation to determine future building, staff, and financial needs. It is the purpose of this paper to deal with methods, procedures, and techniques that will make adequate examination of local conditions possible and thus prevent ill-considered action springing from vague generalities or lack of action as a result of lack of knowledge of local and national trends.

While the methods of estimating the general population are related to the problem of estimating the school population, for the purposes of simplicity and with a view to limiting this paper, the problem of general population will not be dealt with to any great extent.

At best, the matter of predicting future school population is hazardous. Reference to Chamberlain and Crawford's *The Prediction of Population and the Enrollment in the School Survey*,[1] which reports an examination of a large number of school surveys made chiefly in the first quarter of the present century, almost completely discourages one when the inaccuracies in prediction are noted. In many of these cases, however, long-term and elaborate projections were made and formulae since proved to be inaccurate were used. Such experiences have led school surveyors in recent years to deal in short-term predictions and known birth, enrollment, and school holding-power data. These statements should not be allowed to discourage efforts to make sensible projection, but they should discourage groundless long-term estimates.

[1] Chamberlain, Leo M., and Crawford, A. B., *The Prediction of Population and the School Enrollment in the School Survey*, University of Kentucky, Bulletin of the Bureau of School Service, Vol. IV, No. 3, Lexington, March, 1932.

Engelhardt and Engelhardt[2] state that all planning of school building programs is based on forecasting. The reason for the need of population forecasts is that changes in economic, political, and social endeavor affect the relationships between the number of people in given areas. Therefore, the purposes for which such predictions are to be used should determine the methods used.

No matter what procedures are used to estimate the future school population, there will be an element of judgment applied to such factors as[3]:

1. The question of out- or in-migration, and its nature
2. The birth rate over a considerable period
3. The proportion of school-age children enrolled
4. The nature of the educational program
5. The age structure of the population
6. The board's policy with respect to providing facilities for those below six years of age and for youths above high school age
7. The distribution of the population
8. The possible increases or decreases in parochial school enrollment

Certainly a knowledge of the nature and extent of the local general population is basic to any school population study and provides invaluable data for the local administrator and his aids not only on their immediate problem, the numbers to be served, but also on matters that have to do with the school program. Roughly, the general population should be studied both as to its character and as to its size. In connection with its character, the following tables and diagrams are presented.[4] Several of these illustrations are actual situations in Indiana communities and are taken from studies in which the University has participated with these local school systems.

TABLE I. AGE DISTRIBUTION OF THE POPULATION OF INDIANA, RUSH COUNTY, AND RUSHVILLE, 1940*

Locality	Under 5 Years		5-19 Years		20-44 Years		45 Years and Over	
	Number	Per Cent of Total	Number	Per Cent of Total	Number	Per Cent of Total	Number	Per Cent of Total
Indiana	268,535	7 8	865,925	25 2	1,284,281	37 4	1,009,055	29 5
Rush County	1,373	7 3	5,116	27 0	6,047	31 9	6,391	33 8
Rushville	420	7 1	1,475	24 8	2,030	34 1	2,035	34 0

*Adapted from *Population, Second Series, Characteristics, Indiana, 16th Census of the United States, 1940*, pp. 17, 53, 117. Used in the *Rushville School Building Survey*, Bureau of Cooperative Research and Field Service, Indiana University, 1945.

[2] Engelhardt, N. L., and Engelhardt, Fred. *Planning School Building Programs*, Bureau of Publications, Teachers College, Columbia University, New York, 1930, p. 72.

[3] Moore, Harold E., *A Critical Analysis of Procedures Employed in a Wartime School Survey*, unpublished Doctoral dissertation, Indiana University, August, 1945, p. 104.

[4] Dr. Moore presented these tables and diagrams in the form of slides during his address.

The age distribution of a local population is highly significant. The data in Table I reveal that Rushville has a smaller percentage of child and youth population and a larger percentage of persons over 45 years of age than does the state as a whole. These data may be obtained for any community from the *U.S. Census.* In a rapidly changing community, or near the end of a census period, the data would be less reliable and might need to be supplemented through a school census of a type to be discussed later in this presentation.

TABLE II. RACIAL COMPOSITION OF POPULATION OF INDIANA, RUSH COUNTY, AND RUSHVILLE, 1940*

Race	Per Cent of Total Population		
	Indiana	Rush County	Rushville
White	96 4	98 4	97 1
Negro	3 6	1 3	2 9
Oriental and others	02	0 0	0 0
Native parentage	96 8	99 7	99 3
Foreign or mixed parentage	3 2	0 3	0 7

*Adapted from *Population, Second Series, Characteristics, Indiana, 16th Census of the United States, 1940*, p. 38. Used in the *Rushville School Building Survey*, Bureau of Cooperative Research and Field Service, Indiana University, 1945.

The racial composition of the population is a significant factor for many communities to consider. The absence of such a problem in Rushville (see Table II) reveals the nature of that community.

TABLE III. CLASSIFICATION OF MEN AND WOMEN WORKERS IN RUSHVILLE, 1940*

Classification	Male	Female	Total	Per Cent of Total	
				Rushville	State
Professional workers	72	60	132	6 5	5 8
Semi-professional workers	24	6	30	1 5	1 0
Farmers and farm managers	28	1	29	1 4	12 7
Proprietors, managers, and officials, except farm	220	40	260	12 8	8 2
Clerical, sales, and kindred workers	234	157	391	19 1	15 7
Craftsmen, foremen, and kindred workers	305	11	316	15 5	13 3
Operatives and kindred workers	278	77	355	17 4	19 7
Domestic service workers	3	112	115	5 6	3 3
Service workers, except domestic	125	71	196	9 6	6 8
Farm laborers (wage workers) and farm foremen	17	1	18	0 9	3.4
Farm laborers (unpaid family workers)					1 4
Laborers, except farm	142	8	150	7 4	7 8
Occupations, not reported	29	18	47	2 3	1 0
Total	1,477	562	2,034	100 0	100 1

*Adapted from *Population, Second Series, Characteristics of the Population, Indiana, 16th Census of the United States, 1940*, pp. 32, 117. Used in the *Rushville School Building Survey*, Bureau of Cooperative Research and Field Service, Indiana University, 1945.

What the workers in a community do is indeed significant to the school planners. The data on Rushville show the proportion of men and women workers and the classification of their activities. Such data reveal much concerning the community's children and the community's educational interests and needs. A comparison of the situation here with that in other communities as well as in the state as a whole would be helpful.

TABLE IV. CLASSIFICATION OF THE OCCUPATIONS OF THE PARENTS OF SCHOOL CHILDREN IN RUSHVILLE, OCTOBER, 1941*

Classification	Fathers	Mothers	Total	Per Cent of Total
Professional workers	25	16	41	5.4
Semi-professional workers	5	0	5	0.6
Farmers and farm managers	50	0	50	6.6
Proprietors, managers, and officials, except farm	61	9	70	9.2
Clerical, sales, and kindred workers	36	27	63	8.3
Craftsmen, foremen, and kindred workers	176	10	186	24.6
Operatives and kindred workers	138	37	175	23.2
Domestic service workers	1	5	6	0.8
Service workers, except domestic (including 58 service men)	97	23	120	15.9
Farm laborers (wage workers) and farm foremen	8	0	8	1.1
Farm laborers (unpaid family workers)	0	0	0	0.0
Laborers, except farm	23	6	29	3.9
Occupations, not reported	2	0	2	0.2
Total	622	133	755	99.8

Rushville School Building Survey, Bureau of Cooperative Research and Field Service, Indiana University, 1945.

Not always are the ratios of the various classifications for the fathers and mothers of the children enrolled in the schools the same as for all of the inhabitants. This proved to be particularly true in Rushville (see Table IV), and it was found to be reflected in the type and ability of the children in the Rushville schools. Particularly if your staff has been sensitive to a change in the nature of your school population would such a comparison be interesting.

TABLE V. SCHOOLING OF THE ADULT POPULATION OF RUSHVILLE COMPARED WITH THAT OF THE WHOLE POPULATION AND THE URBAN POPULATION OF THE STATE, 1940*

Years of Schooling	Per Cent of Total Population		
	State as a Whole	Urban of State	Rushville
NO YEARS COMPLETED	1.3	1.6	.9
GRADE SCHOOL			
1 to 4 years	6.4	6.3	4.8
5 to 6 years	9.9 | 57.8	9.5 | 53.3	11.0 | 50.5
7 to 8 years	41.5	37.5	34.7
HIGH SCHOOL			
1 to 3 years	15.2	16.9	15.7
4 years	15.5 | 30.7	17.1 | 34.0	19.5 | 35.2
COLLEGE			
1 to 3 years	5.2	5.6	6.5
4 years or more	3.8 | 9.0	4.7 | 10.3	5.1 | 11.6
NOT REPORTED	1.1	0.8	1.6
MEDIAN YEARS COMPLETED	8.5	8.7	8.9

*Adapted from *Population, Second Series, Characteristics of the Population, Indiana, 16th Census of the United States, 1940*, pp. 25, 116. Used in the *Rushville School Building Survey*, Bureau of Cooperative Research and Field Service, Indiana University, 1945.

One of the most important factors in determining the character of a local population is the schooling of the adult population of the community (see Table V). The level of school completed (higher than the state average in the case of Rushville) may determine the level of support, the interest, the drop-out points, and the adult educational needs. In communities with marked in-migrations, the schooling of the adult population of the sources of the in-migrations is highly important. In a community like Rushville, where there is some evidence of a changing type of school population (as shown in Tables III and IV), periodic re-examination of this characteristic is highly desirable.

The quantitative aspects of the general population need to be carefully examined. The relationship of these aspects to the school population should be determined and carefully considered in studying the school population. Earlier statements concerning the importance of basing predictions on birth rates, school enrollments, and holding power of the school should not keep the local administrator from being thoroughly conversant with the general population data.

TABLE VI. RATE OF INCREASE IN POPULATION IN RUSHVILLE AS COMPARED WITH THAT OF INDIANA AND THAT OF THE UNITED STATES*

Year	Population of United States	Per Cent of Increase	Population of Indiana	Per Cent of Increase	Population of Rushville	Per Cent of Increase
1900	75,994,575		2,516,462		4,541	
1910	91,972,266	21 0	2,700,876	7 3	4,925	8 5
1920	105,710,620	14 9	2,930,390	8 5	5,498	11 6
1930	123,091,000	16 4	3,238,503	10 5	5,709	3 8
1940	131,669,275	7 0	3,427,796	5 8	5,960	4 4

*Adapted from *Population, First Series, Number of Inhabitants, Indiana, 16th Census of the United States, 1940*, pp. 1, 11. Used in the *Rushville School Building Survey*, Bureau of Cooperative Research and Field Service, Indiana University, 1945.

A comparison of the rate of increase in population in the local community with that in the state and nation at given time intervals will reveal whether the population increase is greater or less than that of the larger units. The figures given in Table VI, when associated with other facts, would certainly discourage the surveyor or local administrator from making predictions of greatly increased school enrollments within the next few years.

TABLE VII. TOTAL POPULATION OF INDIANA, RUSH COUNTY, RUSHVILLE, AND THREE TOWNSHIPS FOR 1920, 1930, AND 1940*

Unit	Population			Per Cent of Increase	
	1920	1930	1940	1920-1930	1930-1940
Indiana	2,930,390	3,238,503	3,427,796	10 5	5 8
Rush County	19,241	19,412	18,927	0 9	−2 5
Rushville	5,498	5,709	5,960	3 8	4 4
Jackson Township	582	593	513	1 9	−13 5
Rushville Township	6,782	7,023	7,338	3 6	4 5
Union Township	1,158	1,170	1,013	1 0	−13 4

*Adapted from *Population, First Series, Number of Inhabitants, Indiana, 16th Census of the United States, 1940*, pp. 1, 11. Used in the *Rushville School Building Survey*, Bureau of Cooperative Research and Field Service, Indiana University, 1945.

Frequently the local school system serves, at least for high school purposes, a wider area than the immediate area being studied. In such cases general population information concerning the area of influence, such as that given in Table VII, will be highly important.

TABLE VIII. POPULATION OF RUSH COUNTY AND RUSHVILLE, 1900-1940*

Year	Number of Inhabitants		Per Cent of Population	
	Rush County	Rushville	Rush County	Rushville
1900	20,148	4,541	77.46	22.54
1910	19,349	4,925	74.55	25.45
1920	19,241	5,408	71.43	28.57
1930	19,412	5,709	70.60	29.40
1940	18,927	5,960	68.50	31.50
1944 (estimated)	18,800	6,354	66.30	33.70

*Adapted from *Population, First Series, Number of Inhabitants, Indiana, 16th Census of the United States, 1940*, p. 5. Used in the *Rushville School Building Survey*, Bureau of Cooperative Research and Field Service, Indiana University, 1945.

Fluctuations between urban and rural areas are frequently significant. Particularly is this true in the case of "urban" developments on the edge of many cities but outside of their civil and educational administration. Table VIII, which reveals almost no total population change in Rush County including Rushville from 1900 to 1940, shows a shift from the rural to the urban areas in the amount of about 10 per cent.

A relatively new problem to many school systems, brought on by the planned economy idea, the war industry requirements for labor, and now by the housing shortage in many communities, is that of the highly concentrated housing developments that frequently yield proportionately large school populations. These populations from widely scattered sources (we found 46 states represented in one room at Charlestown and 36 states and Canada in the Willow Run Project) frequently shift rapidly and consequently bring new problems of education, recreation, health, and citizenship.

TABLE IX. FAMILY SIZE, YPSILANTI SCHOOL DISTRICT NO. 1, WILLOW RUN SCHOOLS*

Size of Family (in Terms of Number of Children)	Total School Children in Each Size Family	
	Number	Per Cent
1	184	10.1
2	404	22.3
3	404	22.3
4	318	18.0
5	236	13.0
6	88	4.8
7	76	4.1
8	42	2.4
9	21	1.2
10	16	0.8
11	8	0.4
12	0	0.0
13	4	0.2
25	8	0.4
Unclassified	8	0.4

*Willow Run School Building Survey, Bureau of Cooperative Research and Field Service, Indiana University, 1945.

Very frequently the planned program of school housing has to be restudied when such housing developments are introduced. The purpose that the housing project serves will frequently be directly related to the nature and number of the school population.

One might expect a very different situation in the Willow Run school project (see Table IX). This is the housing development, mostly temporary in nature, planned to serve Ford's Willow Run plant. Experience had revealed what might be expected in school populations in such housing areas and an almost exact prediction was made of the school population to be served. Had the war continued for another half dozen years the school problem would have become entirely different, since a high school population would have developed—a condition which did not exist because most of the inhabitants were young families. Fortunately, in such planned areas an almost complete picture can be maintained through rental and other records.

To this point the characteristics and quantitative aspects of the population have been considered. While they are extremely important, actual estimates and predictions grow chiefly out of birth, census, and enrollment data. The following illustrations are of this nature.

TABLE X. NUMBER OF BIRTHS IN RUSH COUNTY AND RUSHVILLE, 1932-1943*

Year	Number of Births in Rush County, including Rushville	Number of Births in Rushville†
1932	258	86
1933	268	96
1934	266	111
1935	227	90
1936	269	84
1937	279	107
1938	308	100
1939	300	108
1940	297	105
1941	280	117
1942	331	133
1943	320	125

*_Rushville School Building Survey_, Bureau of Cooperative Research and Field Service, Indiana University, 1945.

†Includes only Rushville residents.

A good beginning in studying the problem is to obtain the birth data for a significant period of years, usually for the city and county in question. It is important that the residence of the parents be considered, or else the data may be misleading. In the data for Rushville (see Table X), the relative constancy may be noted.

A comparison of the number of pupils entering the first grade in a given year with the number born six years earlier over a number of years will permit the establishment of a ratio or index that may be applied to the current birth figures to determine the number to enter the first grade of a given year. Factors sometimes enter to upset this relatively simple calculation which, in the case of Rushville, is constant (see Table XI).

TABLE XI. NUMBER OF PUPILS ENTERING RUSHVILLE SCHOOLS IN FIRST GRADE SIX YEARS AFTER BIRTH*

Year	Number Entering First Grade	Number of Births Six Years Earlier	Ratio of Number Entering First Grade to Number of Births Six Years Earlier
1938	92	86	107%
1939	90	96	93%
1940	70	111†	63%
1941	83	90	91%
1942	97	84	115%
1943	103	107	96%
1944	105	100	105%
Median	92	96	96%

*_Rushville School Building Survey_, Bureau of Cooperative Research and Field Service, Indiana University, 1945.

†The fact that there were 111 births among Rushville residents in 1934, with only 70 pupils entering first grade in 1940 is explained by Superintendent L. A. Lockwood, Rushville Public Schools: "The chief factor for this was the out-migration movement of parents to places of greater industrial activity. This did not happen all at once, but when it came time for the 111 children to enroll in school, many were gone."—Letter to H. E. Moore from L. A. Lockwood, dated April 27, 1945.

In the case of Columbus, on the other hand, the figures show that an entirely different condition prevailed (see Table XII). With the exception of one year, more children entered the first grade than were born in the city six years earlier. So pronounced was this situation that, over the eight years shown, the median entering group was 150 per cent of the group born six years earlier. A pronounced in-migration brought on by prewar and wartime industrial development, accompanied by a housing development to accommodate the influx, accounts for this interesting situation. The contrast between the Rushville and the Columbus ratios and the attendant schoolhousing problem is an interesting one.

TABLE XII. NUMBER OF PUPILS ENTERING COLUMBUS SCHOOLS IN FIRST GRADE SIX YEARS AFTER BIRTH*

Year	Number Entering First Grade	Ratio to Births 6 Years Earlier
1937	193	126%
1938	240	130%
1939	173	94%
1940	202	170%
1941	204	174%
1942	203	185%
1943	228	170%
1944	183	115%
Median	202.5	150%

*_Columbus School Building Survey_, Bureau of Cooperative Research and Field Service, Indiana University, 1945.

Not only is it a question of the number of births and in- or out-migration that should be considered, but, more especially, the actual situation as revealed by a census is important. Such a census might reveal only the preschool population or, preferably, a complete and continuous census might be made that would reveal both preschool and school data as well as many items of related information helpful in planning the school program. Illustrations of these approaches follow.

TABLE XIII. NUMBER OF CHILDREN INCLUDED IN THE PRESCHOOL SAMPLING*

School District	Number of Blocks Sampled	Average Number of Preschool Children per Block	Number of Blocks in District	Total Number of Preschool Children
Jefferson	9	5.3	74	396
Wilson	8	3.0	73	219
McKinley	11	4.3	108	461
Garfield	7	3.6	70	252
Total	33	4.1	325	1,328

*_Columbus School Building Survey_, Bureau of Cooperative Research and Field Service, Indiana University, 1945.

In the absence of a complete or even a preschool census, a sampling of preschool data was made in Columbus (see Table XIII). This approximately 10 per cent sampling of blocks by school districts when extended for the district reveals the estimated number of preschool children in the city. When it is recognized that six years of child life are represented in such a sampling, and that this number may be compared to the same number of years of child life in grades 1-6, the significance of the total may be appreciated. The schoolhousing problem is brought to the fore when it is noted that the enrollments in grades 1-6 in the four schools at the time of the census was 220, 466, 426, and 252, respectively.

TABLE XIV. ELEMENTARY IN-SCHOOL POPULATION AND PRESCHOOL POPULATION BY SCHOOL DISTRICTS, RUSHVILLE, 1944*

School Districts	In-School Population (Grades 1-6)	Preschool Population (Less than 1 Year to 6 Years of Age)
Belle Gregg	220	178
Havens	159	173
Annex	188	172

*_Rushville School Building Survey_, Bureau of Cooperative Research and Field Service, Indiana University, 1945.

A complete preschool census was made in Rushville, with the results shown in Table XIV. The constancy of the Rushville situation previously noted is emphasized when it is seen that the totals of the two columns are 567 and 523, respectively. Similar preschool studies are being or have been made in Bedford and Crown Point.

The 1944-1945 Crown Point elementary school population (grades k-6) is heaviest in the area around the Northward school. Inasmuch as this school was already crowded, it appeared that an addition might be necessary. Further data on residence of the preschool population changed this conclusion.

However, the concentration of population around the Northward school present in the in-school group is not present in the preschool group. In contrast, the preschool pressure will appear on the Southward school, relieving the Northward situation. Fortunately, the group can be accommodated with some remodeling of the Southward building.

This situation shows how data concerning a population, if considered superficially, might lead to an incorrect conclusion on building needs. Obviously, this sort of complete census that reveals actual residence is superior to the Columbus preschool sampling that revealed residence of children only in a very general way.

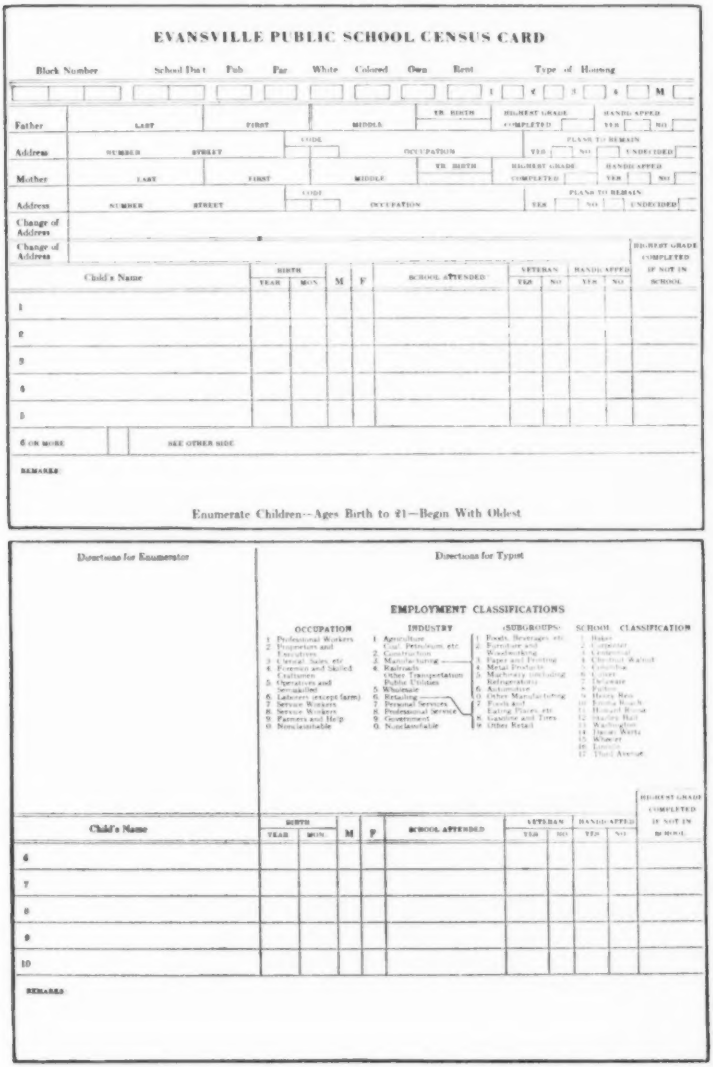
A still more satisfactory approach to the problem is reflected in the method employed by the Evansville schools in their complete and continuous family census. This census which is taken on the type of card shown in Figure 1, not only reveals the child data on the preschool and school age basis, but furnishes much supplementary data concerning Evansville school families. This approach is in contrast to the periodic counts taken by the school systems already discussed. This continuous family census plan has been developed by Evansville College and the Evansville city schools, with service by the University in a consultant capacity. A similar approach is being made in the study of the Noblesville and Noblesville Township schools, in which the University is participating.

On the back of the Evansville card space is given for the employment classification and for listing children of the larger families. Such a card can be developed to fit the needs of a particular school system. The data for this complete census were gathered in Evansville and Noblesville by highly selected eleventh and twelfth grade students, under careful supervision. The results in the Evansville study indicate that it may exceed the accuracy of the federal census.

The data from the continuous family census card have been punched on I.B.M. cards and tabulations made mechanically. Such a method insures greater accuracy, saves clerical time and expense, and makes possible comparisons virtually impossible when the work is done by hand. This service has been provided by the University on a cost basis.

After the number of births has been determined and an actual count of the preschool and school age children has been made, it is necessary to integrate these data with current enrollment figures and to determine in what degree the school system is able to hold its enrollees once they have become a part of the school population.

An interesting graphical method of presenting birth, enrollment, and holding power in the Berkeley public schools employs the grade and the year of birth on its "X" axis and the number of children born to Berkeley parents and the school enrollment on its "Y" axis. If the ratio between births and enrollments is maintained for the 1939-1944 births, a marked enrollment increase is in the immediate future. Such information should only be presented to school board members and taxpayers whose hearts can withstand violent shocks, and it is suggested that school superintendents facing such conditions might logically decide it was time to seek a promotion.



EVANSVILLE PUBLIC SCHOOL CENSUS CARD

Block Number | School Dist | Pub | Par | White | Colored | Own | Rent | Type of Housing 1 2 3 4 M

Father — LAST | FIRST | MIDDLE | YR. BIRTH | HIGHEST GRADE COMPLETED | HANDICAPPED YES NO

Address — NUMBER | STREET | CODE | OCCUPATION | PLANS TO REMAIN YES NO UNDECIDED

Mother — LAST | FIRST | MIDDLE | YR. BIRTH | HIGHEST GRADE COMPLETED | HANDICAPPED YES NO

Address — NUMBER | STREET | CODE | OCCUPATION | PLANS TO REMAIN YES NO UNDECIDED

Change of Address

Change of Address

Child's Name	BIRTH YEAR	BIRTH MON.	M	F	SCHOOL ATTENDED	VETERAN YES	VETERAN NO	HANDICAPPED YES	HANDICAPPED NO	HIGHEST GRADE COMPLETED IF NOT IN SCHOOL
1										
2										
3										
4										
5										
6 OR MORE					SEE OTHER SIDE					

REMARKS

Enumerate Children—Ages Birth to 21—Begin With Oldest

Directions for Enumerator

Directions for Typist

EMPLOYMENT CLASSIFICATIONS

OCCUPATION	INDUSTRY	SUBGROUPS	SCHOOL CLASSIFICATION
1. Professional Workers	1. Agriculture	1. Foods, Beverages, etc.	1. Baker
2. Proprietors and Executives	2. Coal, Petroleum, etc.	2. Furniture and Woodworking	2. Carpenter
3. Clerical, Sales, etc.	3. Construction	3. Paper and Printing	3. Commercial
4. Foremen and Skilled Craftsmen	4. Manufacturing	4. Metal Products	4. Electrical Manual
5. Operatives and Semiskilled	5. Railroads	5. Machinery including Refrigeration	5. Columbia
6. Laborers (except farm)	Other Transportation	6. Automotive	6. Lynch
7. Service Workers	Public Utilities	7. Aircraft	7. Delaware
8. Service Workers	6. Wholesale	8. Other Manufacturing	8. Perkins
9. Farmers and Help	7. Retailing	9. Foods and Eating Places, etc.	9. Henry Ness
0. Noncla ssifiable	8. Personal Services	0. Gasoline and Tires	10. Evans Beach
	9. Professional Service	1. Other Retail	11. Howard Roosa
	0. Government		12. Stanley Hall
	0. Nonclassifiable		13. Washington
			14. Oscar Watts
			15. Wheeler
			16. Lincoln
			17. Third Avenue

Child's Name	BIRTH YEAR	BIRTH MON.	M	F	SCHOOL ATTENDED	VETERAN YES	VETERAN NO	HANDICAPPED YES	HANDICAPPED NO	HIGHEST GRADE COMPLETED IF NOT IN SCHOOL
6										
7										
8										
9										
10										

REMARKS

Fig. 1. Front and back of the Evansville Public School Census Card

TABLE XV. PER CENT OF PUPILS WHO ENTERED FIRST GRADE FROM 1932 TO 1944 WHO BECAME SECOND, THIRD, FOURTH, FIFTH, AND SIXTH GRADERS*

School Year†	Grades					
	1	2	3	4	5	6
1932-1933	100 0					
1933-1934	100 0	95 1				
1934-1935	100 0	90 0	88 3			
1935-1936	100 0	94 8	90 8	95 1		
1936-1937	100 0	92 2	96 5	97 5	95 1	
1937-1938	100 0	90 4	72 4	96 5	96 6	90 2
1938-1939	100 0	93 6	82 4	75 8	92 2	91 6
1939-1940	100 0	82 3	90 5	80 8	74 1	87 9
1940-1941	100 0	87 8	82 3	87 3	88 0	73 2
1941-1942	100 0	85 2	85 0	75 2	87 3	83 2
1942-1943	100 0	94 5	88 2	81 3	80 5	87 3
1943-1944	100 0	92 3	96 7	96 0	75 7	77 8
1944-1945	100 0	102 8	100 9	80 2	102 9	66 3
Median	100 0	92 2	88 3	84 3	88 0	85 2

*_Rushville School Building Survey_, Bureau of Cooperative Research and Field Service, Indiana University, 1945.

†September of each year.

In Table XV, the holding power of the Rushville schools in grades 1-6 is shown. An analysis of the data reveals that the median percentage of first grade pupils who became second graders was 92.2 per cent. By tracing a class through the grades and applying the median percentages for the various levels, a table could be made showing the expected enrollment in any given year within the life of the birth and enrollment data in hand.

TABLE XVI. PREDICTION OF FUTURE ELEMENTARY POPULATION, BY GRADES AND YEARS*

Grade	1944-1945	1945-1946	1946-1947	1947-1948	1948-1949	1949-1950
1	185	240	250	280	300	280
2	160	154	199	208	232	249
3	163	160	154	199	208	232
4	169	165	162	155	202	210
5	166	172	167	164	159	207
6	143	169	165	160	158	152
Total	986	1,060	1,147	1,166	1,259	1,330

*_Columbus School Building Survey_, Bureau of Cooperative Research and Field Service, Indiana University, 1945.

Such an extension has been made in connection with the Columbus data, shown in Table XVI. Beginning with 1944-1945, when the actual enrollment was used, the table was developed by estimating the entering first graders on succeeding years from the birth data. The advantages of using such data are apparent. One half of the table is made up from actual enrollment data and the determined holding power of the Columbus schools. (Grade 1, with 185 pupils in 1944-1945 would become grade 6 with 152 in 1949-1950.) The entering groups from 1945-1946 are from known birth figures to which the holding power percentages were applied to complete the table. The similarity of the estimated 1949-1950 enroll-

ment in grades 1-6 and the preschool sampling figure for the same grades, 1,328, shown in Table XIII, is interesting.

TABLE XVII. PER CENT THAT ENROLLMENT IN GRADES 7 AND 8 IS OF ENROLLMENT IN GRADES 1 TO 6, AND PER CENT THAT ENROLLMENT IN GRADES 9 TO 12 IS OF ENROLLMENT IN GRADES 1 TO 8*

School Year	Per Cent That Enrollment in Grades 7-8 Is of That in Grades 1-6	Per Cent That Enrollment in Grades 9-12 Is of That in Grades 1-8
1932-1933	27	45
1933-1934	31	39
1934-1935	33	40
1935-1936	35	43
1936-1937	30	46
1937-1938	32	51
1938-1939	35	51
1939-1940	35	55
1940-1941	39	51
1941-1942	37	52
1942-1943	37	52
1943-1944	37	45
1944-1945	34	44
Median	35	46

**Rushville School Building Survey*, Bureau of Cooperative Research and Field Service, Indiana University, 1945.

With a base of actual elementary enrollment, a fairly close estimate of junior and senior high school enrollment can be made by determining the percentage that the enrollment in grades 7 and 8 is of the grades 1-6 enrollment and the percentage that the grades 9-12 enrollment is of that in grades 1-8. This was done in the Rushville survey (see Table XVII). While not statistically defensible, this procedure will probably give us as good a figure as any other approach and can be used with relative safety for building planning. In the case of transferred high school enrollment, these pupils would have to be added to the number of resident pupils. The median should be obtained by using enough years to level out the exceptions that might develop periodically.

TABLE XVIII. ESTIMATED POPULATION TO BE ACCOMMODATED IN 1950*

Grade Level	Number of Pupils
Kindergarten	200
Elementary (Grades 1-6)	1,300
Junior High School (Grades 7 and 8)	550†
Senior High School (Grades 9-12)	1,350‡
Total	3,400

**Columbus School Building Survey*, Bureau of Cooperative Research and Field Service, Indiana University, 1945.

†Includes an estimated 200 pupils at this level from Columbus Township.

‡Includes an estimated 675 pupils at this level from Bartholomew County.

Table XVIII is a summary of the estimated school population to be accommodated in 1950 in Columbus. The figure of 1,300 for grades 1-6 was obtained following comparison of results from three methods of estimating. One of these, 1,330, was shown in Table XVI. The second,

1,328, was shown in the preschool sampling shown in Table XIII. The third basis of estimate was that of applying the percentage that the grades 1-6 population at different times (i.e., 1920, 1930, 1940, 1944) was of the total population at the same times and applying the median of these figures to the estimated 1950 population. This procedure yielded a figure of 1,275, which was relatively close to the two other figures already obtained. There has not been time to prove or disprove the accuracy of the estimate, but it is interesting to note that the 1945-1946 grades 1-6 enrollment was 1,032 while the estimate was 1,060.

Figure 2 represents the relationship between the Bedford general population and the school enrollment. It warns against using the general population as a basis of estimating school enrollment without checking by other means. The figure could have been made more meaningful by having birth figures also shown.

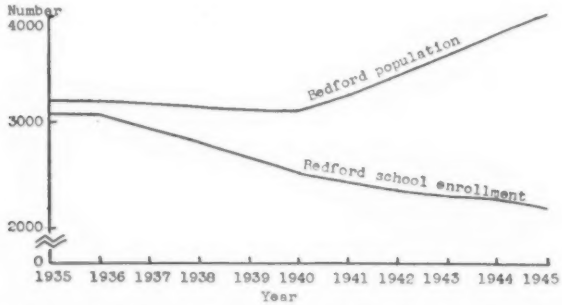


Fig. 2. Relation between Bedford population and school enrollment, 1935-1945. (For purposes of comparison, the total population figure of Bedford was divided by 4.)

Note this comparison of births, school enrollment, and city population in Allentown, Pennsylvania, shown in Figure 3. It is interesting to note the same pattern in the period 1935-1945, already shown for Bedford. Failure to project the births prevents the graph from being most meaningful.

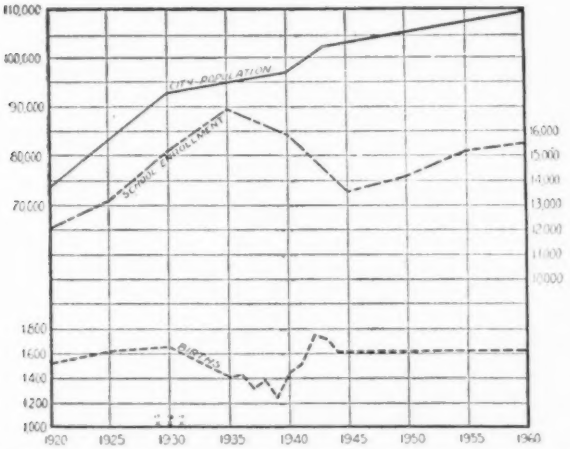


Fig. 3. City population in Allentown, Pennsylvania, school enrollment, and births from 1920 to 1943, with projection to 1960

In Figure 4 enrollment is projected to 1960. Note how elementary enrollment levels out after 1950. While the expected pattern depends upon the birth rates of the next few years, the birth rate depends on marriage, which depends on employment, homes, etc. Thus the future is relatively uncertain in so far as accurate prediction is concerned.

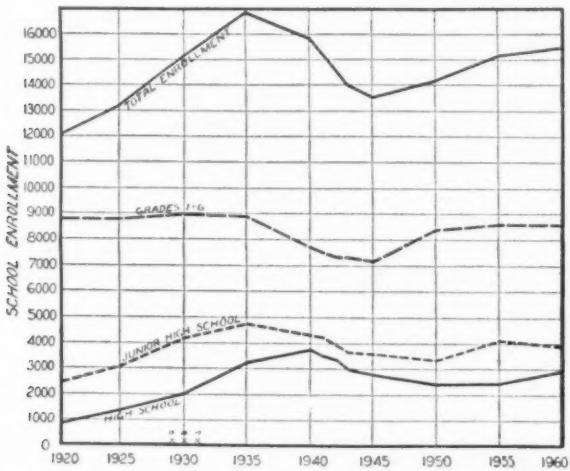


Fig. 4. School enrollment in Allentown, Pennsylvania, from 1920 to 1943, with projection to 1960

Figure 5 illustrates another means of showing school enrollments and their relationships. This comparison might serve to emphasize elementary school needs. It might also aid in determining the timing of building improvements in a given school situation.

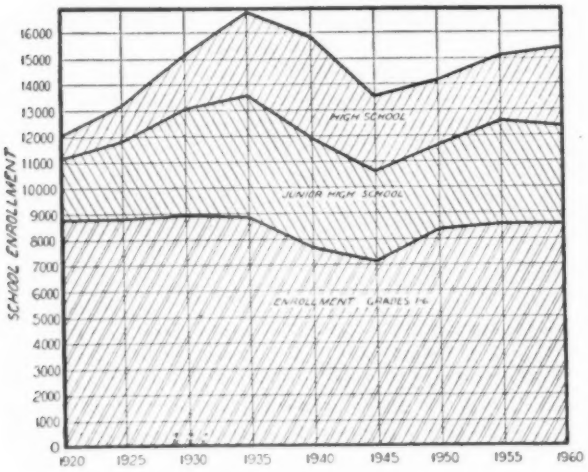


Fig. 5. School enrollments and their relationships in Allentown, Pennsylvania, from 1920 to 1943, with projection to 1960

The methods of estimating the school population which have been presented illustrate techniques which have been used in recent School of Education studies. As practical school men, you will realize the necessity of basing such studies on local conditions and choosing methods which fit the actual situation.

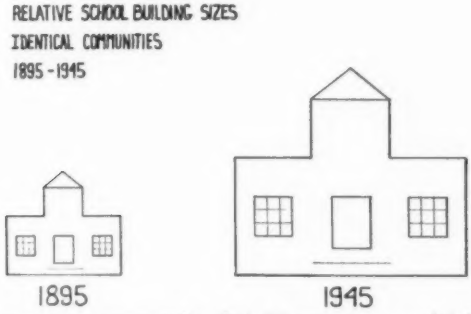
Financing the School Building Program

by

DON L. ESSEX

THE purpose in this paper is to present a discussion of certain matters relating to the financing of school buildings. No attempt is made to portray the total picture or even to offer a connected discourse. The matters discussed are important, however, and are particularly relevant to our problems of today.

School building costs 50 years ago and now.—We see in many communities a brand new school building, and perhaps in the same community will be the old school building which was abandoned when the new structure was erected. We see a vast difference in the sizes of the two buildings and we hear a great deal about the difference in cost. I should like now to present a brief analysis which was made in our office of these two matters.



Let us assume a community that 50 years ago maintained an elementary-high school building for 500 pupils. The school would be organized on an 8-4 plan with probably 450 pupils in grades 1-8 and 50 in 9-12. The building for that school would contain 12 elementary classrooms, a study hall seating possibly 80 pupils, a science laboratory, and about four other high school classrooms. There would be a small office located over the entryway on the second floor. The building would have brick walls, slate or tile roof, with the entire interior—floors, stairs, and joists —of wood. This description is based on the observation of many old school buildings in New York State.

The building probably would contain 250,000 cu. ft., part of which would be wasted because of high ceilings and extremely wide corridors.

In estimating the cost of this building, a cubic foot cost of 15 cents has been used. At this rate (250,000 x 15c) the building would cost $37,500. In order to avoid exaggerating the difference in the cost of the building of 50 years ago and the one of today, I have rounded off this this figure at $45,000.

Now let us see what a new building would cost for an identical community today. Please note that I have not said the same community but one identical. The parents would be of the same age as the parents 50 years ago. There would be the same number of children of school age.

It is estimated that instead of 500 pupils there would be 650 pupils going to school. This increase is due to the extension upward of the compulsory education age, the greater holding power of the high school, and the extension of the school age downward to include kindergarten pupils. It is estimated that, based on current practices in planning, the school building for this community would now contain about 1,000,000 cu. ft. That is, the volume of this building would be four times the volume of the building of 50 years ago.

Now as to the cost—it is difficult to select a reliable cubic foot figure today because there are so few school buildings being constructed, but certainly in New York State a school building for this community would not cost less than 45c a cubic foot. Many estimates run higher than 60c. I would, therefore, consider 45c a very conservative figure. On this basis the total cost of the building would be $450,000—just ten times as much as the cost of the building of 50 years ago. I believe that I have erred on the side of conservatism, and suspect that the ratio is probably 12 or 13 to 1 instead of 10 to 1.

Now to return for a brief discussion of the reasons for the 4 to 1 ratio in cubage. All we need to do is to review the expansion of the educational program in the past 50 years and we see the answer. The school building has the primary function of housing a given educational program. The building must, of course, be safe, sanitary, and comfortable. This standard is an axiom in school building planning, and cannot be considered a function. To repeat, the primary function of a school building is to house a given educational program.

During the past 50 years, as the educational program expanded, the school plant necessarily expanded also. Homemaking, agriculture, industrial arts, physical training, increased emphasis on music and art, health service, guidance, all require extra building space. Consolidation of schools with the need for transportation has resulted in the installation of cafeterias and the construction of school bus garages.

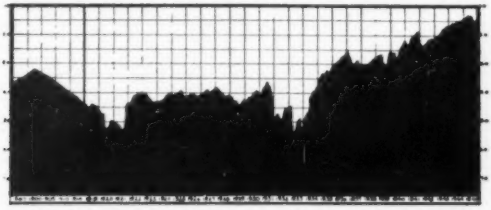
Take alone the matter of physical education and the introduction of basketball. Not only do we have spacious gymnasiums with considerable seating space for spectators, but generous provision is made for lockers

and showers, corrective rooms, physical education offices, and sometimes swimming pools. I wish that we had more swimming pools. I would like to see one in every community. Bowling, rifle practice, table games, and the like are also demanding building space.

All of these new building facilities, springing directly from the expansion of the educational program, add very substantially to the cubage of the building and in themselves almost wholly account for the 4 to 1 ratio in volume of building.

Bond interest rates and school plant costs.—All of us are greatly disturbed about present-day school building costs and are wondering if there are many districts which will be able to advance their much needed projects. There are now being processed through our office in Albany 200 major school building projects estimated to cost, on the basis of present-day calculations, more than $60,000,000. The boards of education sponsoring these projects are wondering how they are going to be able to finance these projects.

Dark as the picture now looks, it has at least one bright spot—interest rates on bonds. Back in 1932 school building costs were averaging about 28c a cubic foot. Bonds were selling at about 5½ per cent. (It has been observed that in the main the price of bonds in New York State follows the Bond Buyer's Index.) Some went as high as 6 per cent which was the maximum permitted in New York State. Some districts received no bids at all.



THE BOND BUYER'S INDEX - 20 MUNICIPALS

Now, what is the picture at present? I am using 45c as an estimate of current cubic foot costs. School bonds in New York State can be sold on the average at 1½ per cent. Consequently, the over-all cost at the present time in comparison with that in 1932 may not be so bad as it seems.

Let us take a school building costing $300,000 in 1932. If financed with 30-year bonds (in New York State most bonds are sold on a 30-year term), at a 5½ per cent interest rate, the total cost of the project, including interest and principal, would be about $575,000. Now, the same building today at 45c a cubic foot (60 per cent higher than in 1932) would cost $480,000. Thirty-year bonds at 1½ per cent would give a total payment of interest and principal of about $595,000. Therefore we see that, including the cost of financing, a school building of today costs but slightly more than one in 1932—in this case only

$20,000 more on a project totaling more than a half million dollars.

In a summary view of the situation we can note with much gratification that, if building costs exceed 1932 costs by no more than 60 per cent, and if bond prices stay at about their present level, the total cost of a school building of today, when the cost of financing is considered, will compare favorably with the 1932 costs.

Non-construction costs of school buildings.—In the consideration of the cost of a new school plant, it is a rather common fault for a board of education to think only of the cost of constructing the building and to neglect the other costs which inevitably enter into the total school plant cost.

Our office studied the detailed costs of about 100 central school plants in New York for the ten-year period of 1930-1940. We found that, taking the cost of the building itself as 100, the following additional percentages were reported: Administrative costs including technical services, such as architects' and engineers' fees, clerk of the works, legal services, and expenses of the board of education, figure up to about 9 per cent of the cost of the building itself. The purchase of site and the cost of site development figures up another 9 per cent. The cost of furniture and equipment adds 9 per cent more. All of this makes a total of 27 per cent over and above the cost of the building.

To put it another way—and probably to add some confusion to your thinking—if the total school plant budget including all costs is 100 per cent, about 79 per cent can be allowed for the cost of construction. The balance will go for administrative, site, and equipment costs.

Note the two tables, Table I using the cost of the building as 100 per cent, and Table II using the total school plant budget as 100 per cent.

Federal and state funds now available for school building construction.—As far as I know the only federal funds now available for the advancement of public school building projects are administered by the Federal Works Agency, Bureau of Community Facilities, under authority of Title V of the War Mobilization and Reconversion Act of 1944. The Federal Works Agency will make loans for the preparation of plans and specifications without interest, with repayment to be made if and when the construction of the building planned is undertaken. That is to say, if the project never goes ahead, repayment is not required.

With regard to what state aid is being offered for school plant construction, I have received a summary from Dr. Ray L. Hamon, Chief of the Schoolhousing Section of the U.S. Office of Education. This summary includes reports from all but 11 states of the Union and is up-to-date as of January 16, 1946. According to Dr. Hamon's report, 13 states make some contribution to local school districts for school building construction, with a range all the way from permission to borrow from a state fund to a consistent, established policy of making regular annual appropriations for state aid for school plant construction. These 13 states are: Alabama, Connecticut, Delaware, Georgia, Minnesota, Missouri, New York, North Carolina, Ohio, Oklahoma, Rhode Island, South Dakota, and Virginia.

TABLE I. RATIO OF CONSTRUCTION BUDGET ITEMS TO BUILDING COST, 100 CENTRAL SCHOOL PLANTS*

Construction Budget Items	Median of 100 Projects
General construction	74 6
Heating and ventilation	12 0
Plumbing	4 7
Electrical	5 3
Other	3 4
BUILDING COST	100 0
Technical services	6 9
Clerk of the works	1 0
Legal services	0 6
Board expenses	0 6
ADMINISTRATION COST	9 1
Site purchase	2 8
Site development	6 0
SITE COST	8 8
FURNITURE AND EQUIPMENT COST	9 2
TOTAL SCHOOL PLANT COST	127 1

*Table published by the University of the State of New York, the State Education Department, Division of School Buildings and Grounds, Albany 1, New York, November 20, 1945.

TABLE II. RATIO OF CONSTRUCTION BUDGET ITEMS TO TOTAL SCHOOL PLANT COST, 100 CENTRAL SCHOOL PLANTS*

Construction Budget Items	Median of 100 Projects
General construction	58 7
Heating and ventilation	9 4
Plumbing	3 7
Electrical	4 2
Other	2 7
BUILDING COST	78 7
Technical services	5 4
Clerk of the works	0 8
Legal services	0 5
Board expenses	0 5
ADMINISTRATION COST	7 2
Site purchase	2 2
Site development	4 7
SITE COST	6 9
FURNITURE AND EQUIPMENT COST	7 2
TOTAL SCHOOL PLANT COST	100 0

*Table published by the University of the State of New York, the State Education Department, Division of School Buildings and Grounds, Albany 1, New York, November 20, 1945.

Dr. Hamon's original summary of this situation appeared in the March 3, 1945, number of *Education for Victory*. He expects to have a new summary to appear in an early issue of *Education for Victory*.

Federal help for school building construction proposed in the U.S. Congress.—The best known bill in Congress relating to federal help for the financing of public works, not for just school buildings alone, is known as S. 1123. It was introduced in the Senate on June 8, 1945, by Senator Thomas of Oklahoma. Its counterpart in the House of Representatives is H.R.4151.

The purpose of S.1123 is, in the words of the bill, "to avert widespread unemployment and disorganization of industry and help to promote the fullest possible utilization of the productive capacity of American industry, provide employment through useful public works, and otherwise promote the general welfare."

The usual run of public works, including school buildings, is mentioned in the bill. A 50 per cent grant is proposed. An appropriation of one billion dollars per year for each of the three fiscal years subsequent to the approval of the act is provided. This is a total of three billion dollars covering a three-year period.

Many other bills have been introduced into the Congress, some relating to hospitals alone, some to airports alone, and one, which is of particular interest to educators, relates only to public school buildings. This bill was introduced into the House of Representatives by Congressman Neely on October 25, 1945, and is known as H.R.4499. Its counterpart in the Senate is S.1719. I wish to devote considerable time to an analysis of this bill, drawing from material prepared by Dr. Hamon of the U.S. Office of Education.

H.R.4499.—H.R.4499 is based on the principle that, since the provision of adequate physical plant facilities cannot well be divorced from considerations of curriculum, of school organization, and of educational policy, and since education is a state function, federal participation in the planning and construction of buildings should take the form of grants-in-aid to the states, with full responsibility resting on the states, with minimum federal safeguards, for the proper planning of their programs for public educational plant facilities.

H.R.4499 defines "public educational plant facilities" as "the land, buildings, equipment, and furniture of tax-supported public educational institutions, including pre-elementary schools, elementary schools, secondary schools, vocational schools, junior colleges, colleges, universities, and public libraries." It provides for "a single agency designated or created by a State to administer the provisions of this Act within the State."

In order for all states and localities to receive equitable treatment, H.R. 4499 provides that federal funds for educational plant facilities be apportioned to states according to an objective formula which recognizes the abilities of the states to finance construction to house their educational services.

The bill provides federal funds for the three important steps in the planning of school buildings:

1. Survey of need
2. Preparation of drawings and specifications
3. Acquisition, construction, or improvement of the school plant

1. Survey of need. One section of the bill proposes $5,000,000 for a three-year survey of school plant needs. The funds are to be apportioned to states as follows: $12,500 lump sum to each state; $1,250,000, according to area; and $2,650,000, according to population in the age bracket 5-24. This section requires no state or local matching. It is

designed to secure simultaneous state-wide planning among the states. Under this formula Indiana would be eligible for $93,810.

2. Preparation of drawings and specifications. A second section proposes $40,000,000 for a five-year program of preparing drawings and specifications, 99 per cent of which is to be apportioned to states according to population in the age bracket 5-24. This section requires equal matching with state and/or local funds. Under this section Indiana would be eligible for $990,752.

3. Acquisition, construction, or improvement of the school plant. A third section proposes $1,500,000,000 for a seven-year program of acquisition, construction, or improvement of public educational plant facilities. All but one tenth of one per cent of this amount is to be apportioned to states according to a formula based on population in the age bracket 5-24 and the per capita net income of the states. This section will induce a similar expenditure of state and local funds on a variable rate of participation according to ability. Under this section Indiana would be eligible for $34,364,000. To receive this amount there must be made available from state and/or local funds the sum of $42,000,000.

Perhaps of particular interest is how a state secures its share of the $1,500,000,000 appropriated for acquisition, construction, or improvement of the plant facilities. Following is the method: The states are arranged in a descending order of their average per capita net income as estimated by the U.S. Department of Commerce (Indiana ranks 16th) and then classified into five groups. There are 8 states in the first group, 8 in the second, 16 in the third, 8 in the fourth, and 8 in the fifth. The apportionment rate by groups is as follows:

First group—40 per cent
Second group—45 per cent (includes Indiana)
Third group—50 per cent
Fourth group—55 per cent
Fifth group—60 per cent

From this, it is apparent that in Indiana the federal government proposes to pay 45 per cent of the cost of a school building project. The state will be eligible to receive $34,364,000 but must be prepared to finance its share of $42,000,000. The $34,364,000 is secured by multiplying the population of persons aged 5-24 by 45 per cent. This result, which is 519,686, is called the index. The sum to be earmarked for Indiana is then determined by dividing this index by the sum of the indices of all of the states (519,686:22,661,743), which gives 2.29 per cent. Applying this percentage to the total funds to be earmarked for the states gives Indiana's share of $34,364,000.

The monies appropriated in this bill are to be administered by the U.S. Office of Education. For work in connection with the survey of need, the office received $500,000; for work in connection with the preparation of drawings and specifications, $400,000; for work in connection with acquisition, construction, or improvement of the school plant, $1,500,000; and total for the U.S. Office of Education, $2,400,000.

Prospects of building in the near future.—It seems to me that one of three things will have to happen before many of our school districts can build.

1. Building costs must come down. We all know that both material costs and labor costs are high, but these two factors alone do not account for the excessively high bids which are being received on public works projects. It is the uncertainty of getting materials and the uncertainty of getting the proper workmen which cause our contractors to bid high. They naturally protect themselves. So far since the end of the war, it is doubtful if there has been very much really competitive bidding. Many bids are simply gestures, made without real study.

It seems reasonable to anticipate that, when reconversion is completed and production is well under way and when demobilization is completed, these uncertainties will be at least partially eliminated, and we may get better bids. It is pertinent to the problem to note that the building construction index, prepared by the New York State Labor Department, is only 18 per cent higher than in 1940. Yet we know that, in comparison with 1940, building construction costs are up probably twice or even three times 18 per cent. The difference is that the index is based on the actual cost of labor and materials whereas, when a contractor bids, he has in mind not only the cost of these two items but also the uncertainty of being able to get the items.

2. At the risk of seeming to pose as an economist—and I most certainly am not one—I would like to say that the cost of school building construction is considerably above the cost of living. It seems to me that in most school districts this high cost of construction can be paid only if incomes go to a higher level than they are now and our people feel rich enough to pay the higher taxes which will be necessary to finance the building program, that is, if we have further inflation.

3. If school building costs do not come down, and we do not get into a higher inflationary period, then a third thing must happen in order to permit us to construct school buildings. There must be financial help from outside the school district. This help may come from the state, but our boards of education seem to feel that most likely it will come from the federal government.

The Indiana School Building Code

by

BERT J. WESTOVER

SOME statesman once said, "Those best governed are those the least governed." From experience we all know that the more complicated becomes our living, the more regimentation we suffer. For example, when we live alone we have few rules to observe. We get married and the living rules multiply. They increase in a direct proportion to the number housed. School living is complicated, and rules seem to increase in direct proportion to the number of bureaus, commissions, and departments having any hand in the school existence.

The National Board of Fire Underwriters in one of their pamphlets stated:

"Sooner or later, in the practice of his chosen profession, the structural engineer or the architect—in fact any one concerned with building construction—is confronted by a set of rules and regulations constituting the building code of his city. The reasons for some of these regulations, such as those on structural strength and stability, are usually apparent. For others the underlying aims may not be as obvious."

We, representing the State of Indiana, have definite rules and regulations covering the structural strength and the areas and heights of schools built of any one of five types of construction. That part is simple to understand, or will be when some of the typographical errors are ironed out of Volume I of the rules and regulations of the Administrative Building Council. It is the complication of multiplicity of regulations that clouds the issue.

Perhaps this group knows of the Administrative Building Council and its authority. By a recent enabling act it was authorized to make rules and regulations governing construction, with accompanying safety and sanitary requirements. Suffice it to say that a most comprehensive set of rules and regulations has been promulgated, thanks to the efforts of a group of architects, engineers, and contractors. With Clarence T. Myers acting as the secretary and editor, rules and regulations covering construction, electrical installations, plumbing and heating, and ventilation have been completed. These regulations are in print and offered to the public under Volumes I, II, III, and IV, respectively.

The Administrative Building Council's Volume I states that additional rules for schools are to be found in Volume V. Volume V has not appeared in print, so far, nor has the Administrative Building Council accepted any rules and regulations for schools. Several state groups examine the results of an architect's endeavor. The State Board of Accounts has to approve all specifications. The State Board of Health studies plans from the standpoint of sanitation, area of site, playground facilities, and unilateral lighting. They base their study partly

on the Sanitary School House Law, Volume III of the *Administrative Building Council Regulations*, and on some State Board of Health rules. The Administrative Building Council checks structural conditions, types of construction, areas, and heights. The State Fire Marshal's Office checks egress and ingress, and panic and fire hazards. The poor architect has all the whims and idiosyncrasies of interpretation of all these agencies to contend with in addition to zoning, fire limits, permits, and special city regulations and interpretations.

We need Volume V. We need it as a working tool for the architect. We need it so that he can have all his information within one cover. We further need it so that the architect may know when he has run the gauntlet of regimentation. The Administrative Building Council has the power to promulgate Volume V and intends to do so. We have been acting as a central clearing house for plans, and this is one big step in the right direction. We will give you Volume V, but we want your ideas as to what Volume V should be.

There have been several tentative recommendations—one by the State Board of Health, and one by Clarence T. Myers, when he was executive secretary of the Administrative Building Council. Of these two, I am of the opinion that the one prepared by Mr. Myers has more merit. It covers the subject more thoroughly and has cross-references to the present four volumes of rules and regulations of the Administrative Building Council.

The Advisory Committee of the Administrative Building Council has a School Committee which has been studying, first, "The Factors Pertinent to School Plant Planning," as recommended by the National Council on Schoolhouse Construction, and second, very briefly, the "School Building Code," by the Connecticut State Department of Education. Both of these later codes have merit. The first document could very easily be adopted *in toto*, and be made the Volume V that has been mentioned in Volume I. The Connecticut Code contains much valuable information. It is like a textbook, with good advice to architects, school boards, and trustees. Most of it is in the form of discussion of problems encountered, followed by regulations in the language of a building code. The regulating part of the code is in smaller print and makes up less than 25 per cent of the book.

The Sanitary Schoolhouse Law, as originally enacted in 1911 and revised in 1913, 1915, 1923, and 1943, forms the regular background for school building design. Section 1 sets up regulations governing the selection of sites, and certain provisions on general construction, floor areas, lighting, and seating. It also covers certain appurtenances within the buildings, along with regulations governing heating and ventilating and sanitary toilet facilities.

Sections 2 and 3 place responsibility upon teachers in safeguarding health and teaching hygiene. These regulations do not concern construction.

Section 4 permits township trustees to levy a tax for a special school fund to be used for building and furnishing of schoolhouses.

Sections 5 and 6 are regular requirements regarding penalties and repeal.

The Sanitary Schoolhouse Law ranges in scope from drainage of site to hygiene to tax levy, and with such a wide coverage there is no one in particular delegated to enforce the measure. The State Board of Health does, however, fill the breach and goes a long way in making this measure effective.

George N. Thompson, of the Bureau of Standards, once said that there is no romance in a building code. It is dull reading, but to write a code it took the wisdom of Solomon, the patience of Job, the genius of Edison, the technique of Einstein, and the tact of Lincoln. We of the Administrative Building Council do not claim the above qualifications, but we do think that we can recognize facts, make distinctions, draw inferences, pass judgment, and concentrate our attention. So we offer to take what has been prepared by the State Board of Health, Clarence T. Myers, the National Council of Schoolhouse Construction, and the Connecticut State Department of Education, and with your cooperation to try to make a Volume V. We hope to give Indiana the working tools by which its most capable architects and engineers may produce schools that will give the student the greatest advantages that can be obtained through the physical school plant.

Planning Schools in View of Initial and Recurring Costs

by

FRANCIS R. SCHERER

AHEAD lies a huge school building program, one destined to share the limited supply of skilled labor and materials with other important projects, such as residential housing and hospitals. This sharing business will not be without benefit, since it will permit the try-out of some of the more recent innovations, several of which, while appearing to be desirable, still require the end test of trial by error.

It appears that building costs of today will continue substantially as they are, perhaps with a slight upward trend for some time to come. There is some relationship between initial cost and the timing with which a project is launched. Unless the needs for the new school are acute, something is to be gained by timing the award of contracts so as to supply work at a time when local or national employment conditions need bolstering. Delay in the award of contracts, however, should not delay the selection of the architect and the preparation of the drawings and specifications. Much is to be gained by accomplishing this in an unhurried manner.

But, regardless of when these projects are undertaken, the relatively high cost may prove to be in many cases a retardant factor, especially where the borrowing capacity of the school district is limited by statute. The joint concern, then, of school administrators and architects is to hold the initial cost of the project at a minimum, without sacrifice of those items essential to the educational program or to safety and health measures. This means a very closely coordinated effort on the part of everyone charged with the responsibility of bringing the project into being.

It is axiomatic that there be close collaboration between the educator and the architect, but our best results can be expected only when each possesses or specially acquires real understanding and some pertinent knowledge in the other's field concerning the school plant. There are too many schools today in which the planning reflects inadequate or insufficient collaboration between the educator, the architect, and the engineer. In some instances there would have been wisdom and economy in the employment of consultants.

Progress comes from research and experiment. This holds true in education in substantially the same manner as in industry. The objective is betterment of the end product. Improvements resulting from industrial research frequently necessitate remodeling and re-tooling. By the same token, changes in the educative processes frequently require changes in existing buildings or a new concept in planning for new building. Industrial changes are much more rapid than are educational changes; therefore, one proceeds with the construction of a school building with

less fear of obsolescence but with a full realization that the design must be such as to afford reasonable flexibility. This flexibility should be such as to permit increasing the initial project as additional children are to be accommodated or educational or community programs broadened. This flexibility should include opportunity to change areas within the initial project without unwarranted costs for alterations to the mechanical services or any interference with the provisions for safety.

In large measure the initial cost of the building is determined by its size, which in turn is closely identified with the number of pupils to be accommodated and the special facilities to be provided for community use. The size of the expenditure warrants a very careful study to determine with reasonable accuracy what the pupil load will be at the time the school opens and to predict population trends. Should there be a choice of employing an optimist or a pessimist for this part of the job, the latter is the safer bet, but then we must give particular attention to the expansibility provisions to be incorporated in the plan. In view of high initial cost, building for anticipated growth may be unwise. A sounder policy might be to provide those additional facilities only when the children of preschool age can be counted and when there is little doubt that the employment conditions in the community are such that sizable labor shifts will not occur. The displacement of millions of people during the past five years can be expected to have some effect upon the stability of local populations during the next decade. Births are up as a result of the war and, while this will soon be reflected in the population of our lowest grades, it is the opinion in some informed quarters that the present birth rate will not be sustained. The present increase, therefore, will create the effect of a wave or bulge passing through our schools. This condition should be most carefully considered in determining the size of the new school. Where sufficient doubt exists, temporary facilities might well be provided as a part of the permanent plant, even at the time of initial undertaking.

Along with the size of building, the initial cost is affected appreciably by the materials of construction, services, and equipment. Perhaps some of us have been a bit too optimistic in assuming that during the war period research and development produced solutions to most of the building construction problems of prewar days. While the publicity departments of some producers may have painted the picture a bit too rosy, at least they have done a splendid job in sustaining morale. There has been substantial improvement made in some of the materials and methods of their employment in building construction.

Many interesting hours can be profitably spent in reviewing material that has been published during the war period by the architectural, educational, engineering, and construction groups pertinent to school building design, services, and equipment. The architectural and engineering professions can be counted upon not to be stampeded in incorporating on a large scale any so-called "new" material into an expensive public building unless that material has been thoroughly investigated for behavior under the extremes of conditions to be encountered. Certainly, full advantage of the technological advances should be taken when such ad-

vances result in lower first costs or permit substantial economies in operating or maintenance costs.

Usually the type of construction to be used is related to the height of the building. The one-story school can be used to advantage throughout the country with the number of pupils and availability of sites being the principal limiting factors. These buildings cannot be typical, but they must be substantially modified to meet climatic conditions, unless serious operating problems are to result. Rochester built its first one-story school in 1914, incorporating in it the integration of each classroom with the immediately adjacent outdoor space for study and recreation. The rigorous climate, however, has permitted only a small utilization of those features.

There comes a point in the economic scale where the size of the school required for the district suggests the wisdom of a multi-storied building, but it is now generally accepted that elementary schools should not exceed two stories in height.

Various groups concerned with the school project are apt to place emphasis upon different phases. The teachers are primarily interested in the size and appointment of the instructional space, the color, the exposure, and the relationship of each instructional facility to the others. The custodial force is primarily interested in the ease with which the building can be heated and kept clean, and the amount of tinkering that must be done with the various gadgets to keep things in good operating condition. School administration, while concerned with both these viewpoints, gives special attention to the over-all, coordinated plan, costs, and safety. The general public is apt to pass its collective judgment as to whether the building is good-looking and an asset to the neighborhood, which of course it should be. Those of the general public who are patrons of that particular school, while manifesting interest in what has been provided for the teaching and safety of their children, are apt to reveal an increasing interest in the facilities that have been provided for them themselves.

So the planners proceed in the knowledge that they are serving a rather sizable clientele. The school district getting the new building may possess "know-how" for determining all of the provisions in the instructional areas required to carry out the proposed educational program. If not, they can readily turn for advice to the specialists in the schools of education at their state universities, to their own state department of education, or to other recognized authorities. Both the architect and the educator have available much reference material and can be informed as to some of the things going on in other parts of the country. Visitation for the purpose of getting first-hand information on things that read well would be an excellent investment—an audio-visual aid without equal.

How significant is this matter of recurring costs? To those on the firing line in matters of operating and maintenance costs the matter of proper design and selection of construction materials and building equipment is one of paramount importance. There is an economic point where a larger initial investment is adequately justified in view of the resultant lower recurring costs. To design and specify otherwise would be unfair to the uninformed taxpayer by unjustifiably adding to his tax

burden. Substantially everything that goes to make up the structure and its equipment should be analyzed in view of that factor of recurring cost. Upon occasion, this might even touch upon the esthetic, and perhaps influence architectural style. An example of this is seen in the increased popularity of the flat-type roof as against a pitched roof in those areas where there is considerable snow and ice.

The almost universal adoption of concrete for foundations leaves no occasion for discussion in the area of construction below ground, but it is necessary at times to conceal piping and other mechanical services without provision for easy access. In such cases, it is true economy to use only materials of known long life. There are other instances where several materials are incorporated as part of an assembly, and it becomes advisable to see that the various materials selected have a nearly uniform life expectancy. An example of this is in the finished roofing job where, excepting for temporary structures, only non-ferrous materials for flashings, gutters, etc., are warranted.

Defensible in the initial cost are the necessary provisions for sufficiently large services, such as water, sewer, electricity, and gas, to provide for the estimated ultimate demand as determined by the regional survey. An example of this can be seen in the electric services. Percentagewise, these have increased tremendously in the last 25 years, both because of educational requirements and because of recognition for higher light intensities, visual-audio aids, conduit systems for fire alarms, program clocks, telephones, signal systems, stage lighting, sound movies, and radios, whether all are installed now or provision made for future consideration.

Custodial service in a large school is a sizable item budgetwise. Greater care in the selection of custodial personnel is warranted. Some large schools now have college-trained men as custodian-engineers. College-trained or not, the right man will easily justify a salary in the upper brackets of the school's payroll.

Materials selected for the floors, walls, and woodwork, and the type of instructional furniture bear directly on the amount of custodial help required for proper housekeeping. In so far as is consistent with the requirements of education, therefore, careful evaluation should enter into the determinations made so as to hold the required maintenance time and costs at a minimum. There seems to be a rather close relationship between low maintenance requirements and long life of the materials used.

Wall surfaces in stairhalls, corridors, and toilet rooms should preferably be of material that cannot be easily marked upon and can be easily washed. In the toilet rooms especially, impervious materials such as glazed brick might well be considered. Absorbent wall surfaces used in these wainscot areas require frequent painting for sanitation and appearance. The cost of such painting upkeep pays for the better construction within a few years.

To many of us, the operating cost item that heads the list after custodial salaries is that of fuel. Whether this be of the solid, liquid, or gaseous type, there is much room for extravagance due to faulty design and operation. Unfortunately, this oftentimes is difficult to detect, ex-

cepting in the light of tests or by comparisons with similar performances or standards. Best safeguard in this field is to be sure that the heating system is designed by persons competent in that field and that the operating personnel are adequately instructed and trained in the proper operation.

Experimental work continues in the field of fluorescent and germicidal lighting, with some indications that the former may result in reducing power costs. Perhaps the latter will prove a worth-while health measure which will reduce absences and thus improve operating costs.

In the field of plumbing, a major economy will come from the installation of the correct number of plumbing fixtures, which in general is substantially fewer than heretofore thought necessary. In this connection you may wish to review the "Use Study of Toilet Fixtures" sponsored by the American Council on Education. Since school toilet rooms require a lot of custodial care and are the areas in the building most subject to abuse by the pupils, the appointments should be sturdy and of good quality. Enameled ironware chips, therefore it should give way to chinaware, preferably double-glazed as this is easier to keep clean. There are places where enameled ironware will be satisfactory, however, such as in homemaking rooms and janitorial areas. Drain lines from chemical laboratories and from such shops as plating and batteries, where acid is spilled into the waste, should have drain-pipes of acid-resistive material.

Wood should be avoided for toilet partitions and for toilet seats. Glass, plastic, or marble will wear well over the years, clean easily, and require no periodic refreshening with paint.

In view of high first costs, there will be consideration to economize by using cheaper materials and equipment. It may not be easy to sell some school boards on certain items that of themselves appear to be either too good or too costly. Where we are convinced that these should be used, our conviction should be based on economic studies, and data from these studies should be made available to school boards to assist them in their decision. We recognize that the choice of materials and equipment must have competent and careful evaluation in terms not only of the initial outlay but also of the ultimate increase upon that initial outlay through those ever-recurring costs for upkeep and operation over the many years of expected use.

A List of Bulletins in the Field of Education, Indiana University

By KATHLEEN DUGDALE

The School of Education at Indiana University has published the following bulletins. All of these may be obtained from the University Bookstore for 50 cents postpaid unless otherwise noted.

Proceedings of the High School Principals' Conference (November 23 and 24, 1923). Vol. I, No. 1, 1924. 85 p. (Supply exhausted.)

Investigation of Nursing as a Professional Opportunity for Girls, Part I, Technical Study; Part II, Vocational Information Bulletin. By Florence E. Blazier. Vol. I, No. 2, 1924. 69 p.

Proceedings of the Eleventh Conference on Educational Measurements. Vol. I, No. 3, 1925. 141 p.

Proceedings of the High School Principals' Conference (November 14 and 15, 1924). Vol. I, No. 4, 1925. 49 p. (Supply exhausted.)

First Revision of the Bibliography of Educational Measurements. Compiled by the Bureau of Cooperative Research. Vol. I, No. 5, 1925. 147 p. (Supply exhausted.)

Proceedings of the Twelfth Conference on Educational Measurements. Vol. I, No. 6, 1925. 76 p.

The Effect of Population upon Ability to Support Education. By Harold F. Clark. Vol. II, No. 1, 1925. 28 p.

Proceedings of the High School Principals' Conference (November 20 and 21, 1925). Vol. II, No. 2, 1925. 77 p. (Supply exhausted.)

A Cross-Indexed Bibliography on School Budgets. By Harold F. Clark. Vol. II, No. 3, 1926. 66 p.

A Comparison of the Results Made on Certain Standardized Tests by Pupils in the Bloomington High School Who Were Taught in Classes of the Same Grade by University Student Teachers and by Regular High School Teachers. By Carl G. F. Franzén. Vol. II, No. 4, 1926. 19 p.

Proceedings of the Thirteenth Annual Conference on Educational Measurements. Vol. II, No. 5, 1926. 103 p.

When to Issue School Bonds. By Harold Florian Clark and Paul Royalty. Vol. II, No. 6, 1926. 16 p.

Students' Attitude Toward Examinations. By Grover T. Somers. Vol. III, No. 1, 1926. 48 p.

Proceedings of the High School Principals' Conference (November 12 and 13, 1926). Vol. III, No. 2, 1926. 27 p.

Index Numbers in School Administration. By Harold F. Clark. Vol. III, No. 3, 1927. 35 p.

Topical Analysis of 234 School Surveys. Compiled by the Bureau of Cooperative Research. Vol. III, No. 4, 1927. 111 p. (Supply exhausted.)

Proceedings of the Fourth Annual Conference on Elementary Supervision. Vol. III, No. 5, 1927. 64 p.

Proceedings of the Fourteenth Annual Conference on Educational Measurements. Vol. III, No. 6, 1927. 66 p.

Some Phases of the Junior College Movement. By I. Owen Foster, Harold F. Clark, Willard W. Patty, and Leo M. Chamberlain. Vol. IV, No. 1, 1927. 125 p. (Supply exhausted.)

Second Revision of the Bibliography of Educational Measurements. By Henry Lester Smith and Wendell William Wright. Vol. IV, No. 2, 1927. 251 p. (75c)

Bibliography of School Buildings, Grounds, and Equipment, Part I. By Henry Lester Smith and Leo Martin Chamberlain. Vol. IV, No. 3, 1928. 326 p. (75c)

Proceedings of the High School Principals' Conference (November 18 and 19, 1927). Vol. IV, No. 4, 1928. 54 p.

The Economic Effects of Education. By Harold F. Clark. Vol. IV, No. 5, 1928. 39 p.

Proceedings of the Fifteenth Annual Conference on Educational Measurements. Vol. IV, No. 6, 1928. 73 p.

Proceedings of the Fifth Annual Conference on Elementary Supervision. Vol. V, No. 1, 1928. 54 p.

Proceedings of the High School Principals' Conference (November 16 and 17, 1928). Vol. V, No. 2, 1928. 33 p.

The Development and Use of a Composite Achievement Test. By Wendell William Wright. Vol. V, No. 3, 1929. 90 p.

An Analysis of the Attitudes of American Educators and Others Toward a Program of Education for World Friendship and Understanding. By Henry Lester Smith and Leo Martin Chamberlain. Vol. V, No. 4, 1929. 109 p.

Tentative Program for Teaching World Friendship and Understanding in Teacher Training Institutions and in Public Schools for Children Who Range from Six to Fourteen Years of Age. By Henry Lester Smith and Sherman Gideon Crayton. Vol. V, No. 5, 1929. 54 p.

Proceedings of the Sixteenth Annual Conference on Educational Measurements. Vol. V, No. 6, 1929. 96 p.

Proceedings of the Sixth Annual Conference on Elementary Supervision. Vol. VI, No. 1, 1929. 73 p.

An Analysis of the Duties of County School Superintendents and Superintendents of Schools in Certain Cities in Indiana. By Henry Lester Smith and Leo Martin Chamberlain. Vol. VI, No. 2, 1929. 94 p.

Proceedings of the High School Principals' Conference (November 22 and 23, 1929). Vol. VI, No. 3, 1930. 51 p.

Cooperative Studies in Secondary Education. By Henry Lester Smith and Carl G. F. Franzén. Vol. VI, No. 4, 1930. 121 p.

Proceedings of the Seventeenth Annual Conference on Educational Measurements. Vol. VI, No. 5, 1930. 103 p.

Proceedings of the Seventh Annual Conference on Elementary Supervision. Vol. VI, No. 6, 1930. 102 p.

A Study in Teacher Supply and Demand in Indiana. By I. Owen Foster, Robert K. Devricks, Harry N. Fitch, Earl C. Bowman, and George L. Roberts. Vol. VII, No. 1, 1930. 77 p.

Proceedings of the High School Principals' Conference (November 7 and 8, 1930). Vol. VII, No. 2, 1930. 70 p.

The Philosophy of Human Relations: Individual and Collective—A Source Book. By Henry Lester Smith and Harold Littell. Vol. VII, No. 3, 1931. 326 p. (75c)

The Psychology of Human Relationships: Individual and Social—A Source Book. By Henry Lester Smith and Levi McKinley Kreuger. Vol. VII, No. 4, 1931. 107 p.

Proceedings of the Eighteenth Annual Conference on Educational Measurements. Vol. VII, No. 5, 1931. 83 p.

Efficiency in College Management. By John Dale Russell. Vol. VII, No. 6, 1931. 143 p.

Bibliography of School Surveys and of References on School Surveys. By Henry Lester Smith and Edgar Alvin O'Dell. Vol. VIII, Nos. 1 and 2, 1931. 212 p. (75c)

Proceedings of the Nineteenth Annual Conference on Educational Measurements. Vol. IX, No. 1, 1932. 139 p.

Bibliography of School Buildings, Grounds, and Equipment—Part II. By Henry Lester Emith and Forest Ruby Noffsinger. Vol. IX, No. 2, 1933. 182 p.

Bibliography of School Buildings, Grounds, and Equipment—Part III. By Henry Lester Smith and Forest Ruby Noffsinger. Vol. IX, No. 3, 1933. 130 p.

A Brief Summary of Literature on Leadership. By Henry Lester Smith and Levi McKinley Krueger. Vol. IX, No. 4, 1933. 80 p.

Proceedings of the Twentieth Annual Conference on Educational Measurements. Vol. X, No. 1, 1933. 98 p.

Bibliography of College and University Buildings, Grounds, and Equipment. By Henry Lester Smith and Forest Ruby Noffsinger. Vol. X, No. 2, 1934. 199 p. (75c)

Factors Affecting the Organization of School Attendance Units. By Raleigh Warren Holmstedt. Vol. X, No. 3, 1934. 32 p.

The Old World Historical Background of Religious and Moral Education in Schools. By Henry Lester Smith, Robert Stewart McElhinney, and George Renwick Steele. Vol. X, No. 4, 1934. 144 p.

Proceedings of the Twenty-first Annual Conference on Educational Measurements. Vol. XI, No. 1, 1934. 96 p.

Bibliography of School Buildings, Grounds, and Equipment—Part IV. By Henry Lester Smith and Forest Ruby Noffsinger. Vol. XI, No. 2, 1935. 216 p.

A Brief Survey of Present-Day Religious and Moral Education in the Schools of Countries Other Than the United States of America. By Henry Lester Smith, Robert Stewart McElhinney, and George Renwick Steele. Vol. XI, No. 3, 1935. 185 p.

Some Practical Efforts to Teach Good Will. By Henry Lester Smith and Peyton Henry Canary. Vol. XI, No. 4, 1935. 169 p.

Proceedings of the Twenty-Second Annual Conference on Educational Measurements. Vol. XII, No. 1, 1935. 97 p.

A Basis for the Improvement of Education in Rural Monroe County, Indiana. By Henry Lester Smith and Forest Ruby Noffsinger. Vol. XII, No. 2, 1936. 168 p.

Reading Readiness—A Prognostic Study. By Wendell William Wright. Vol. XII, No. 3, 1936. 46 p.

Proceedings of the Twenty-third Annual Conference on Educational Measurements. Vol. XII, No. 4, 1936. 60 p.

Bibliography of Literature on the Teaching of English. By Henry Lester Smith and William Isaac Painter. Vol. XIII, No. 1, 1936. 299 p.

Bibliography of Literature on Education in Countries Other Than the United States of America. By Henry Lester Smith and William Isaac Painter. Vol. XIII, No. 2, 1937. 341 p. (75c)

Character Development Through Religious and Moral Education in the Public Schools of the United States. By Henry Lester Smith, Robert Stewart McElhinney, and George Renwick Steele. Vol. XIII, No. 3, 1937. 137 p.

Proceedings of the Twenty-fourth Annual Conference on Educational Measurements. Vol. XIII, No. 4, 1937. 100 p.

Bibliography of Literature on Education in Countries Other Than the United States of America (January 1, 1919, to December 31, 1924). By Henry Lester Smith and William Isaac Painter. Vol. XIV, No. 1, 1937. 139 p.

Two Studies in Education. By Henry Lester Smith and Merrill Thomas Eaton. Vol. XIV, No. 2, 1938. 42 p.

Bibliography of School Surveys and of References on School Surveys (Supplement to Vol. VIII, Nos. 1 and 2). By Henry Lester Smith and Edgar Alvin O'Dell. Vol. XIV, No. 3, 1938. 144 p. (75c)

Proceedings of the Twenty-fifth Annual Conference on Educational Measurements. Vol. XIV, No. 4, 1938. 37 p.

Remedial Instruction in Reading with College Freshmen. By Nila Banton Smith. Vol. XV, No. 1, 1938. 35 p.

Two Studies in Arithmetic. By Henry Lester Smith and Merrill Thomas Eaton. Vol. XV, No. 2, 1939. 91 p.

The Relation of Retention to Speed of Learning. By Henry Lester Smith and Merrill T. Eaton. Vol. XV, No. 3, 1939. 105 p.

Proceedings of the Twenty-sixth Annual Conference on Educational Measurements. Vol. XV, No. 4, 1939. 53 p.

An Experimental Study of Standards for the Selection of Candidates for Teacher-Training Institutions. By Henry Lester Smith and Merrill Thomas Eaton. Vol. XVI, No. 1, 1939. 72 p.

State Control of Public School Finance. By Raleigh Warren Holmstedt. Vol. XVI, No. 2, 1940. 71 p.

Teacher Tenure in Indiana and the Courts. By Henry Lester Smith and R. Foster Scott. Vol. XVI, No. 3, 1940. 81 p.

Twenty-seventh Annual Conference on Educational Measurements. Vol. XVI, No. 4, 1940. 37 p.

A Study of the English Usage, Spelling, and Vocabulary of 251 Graduate Students at Indiana University. By Henry Lester Smith and Merrill T. Eaton. Vol. XVI, No. 5, 1940. 71 p.

The Teaching of Arithmetic to Low-Ability Students in the Elementary Schools. By Henry Lester Smith and Merrill T. Eaton. Vol. XVI, No. 6, 1940. 130 p.

An Analysis of the Achievement of 164 Sophomores Enrolled in Teacher-Training Courses at Indiana University. By Henry Lester Smith and Merrill T. Eaton. Vol. XVII, No. 1, 1941. 31 p.

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